AGRICULTURAL CHEMICALS

1960-1961 BUYER'S GUIDE

In this issue:

Repellents for Fly Control on Livestock

Fertilizer Consumption Up 11.7% in '59-'60

ACS Fertilizer Div. Highlights
Steam Granulation
New Polyphosphate Fertilizer
European Fertilizer Technology

Chemicals in Food Production—Featured at NACA

Farmer Attitudes Toward Pesticides —Survey of Iowa Farmers

APPLICATOR SECTION

October 1960

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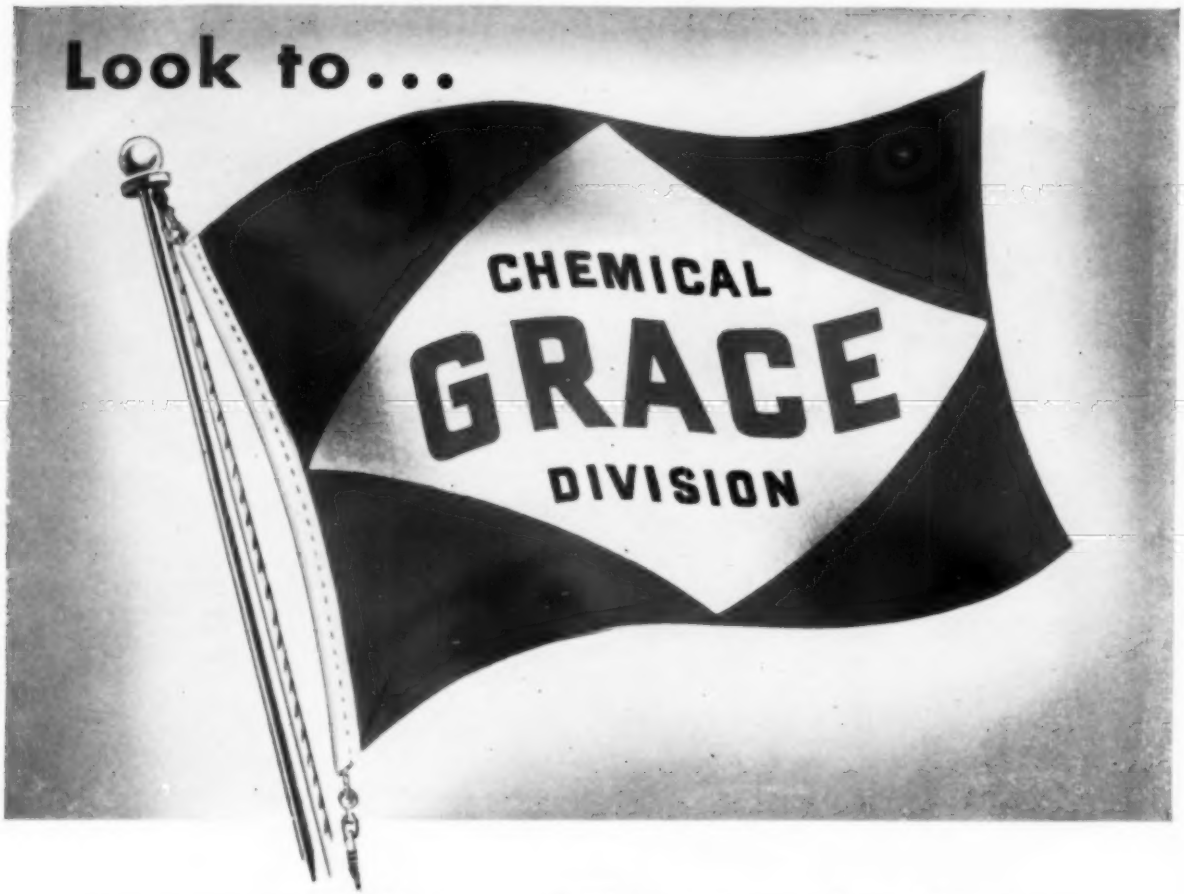

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1960-1961 BUYER'S GUIDE

This Month's Cover

A special feature of this month's issue of AGRICULTURAL CHEMICALS is the 1960-1961 Buyer's Guide (pages 55 to 82). In addition, a separate listing of new equipment starts on page 136.

AG CHEM

Vol. 15, No. 10 **October, 1960**

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BOOK REVIEWS

Plant Pathology. An advanced treatise. Edited by J. G. Horsfall and A. E. Dimond. Vol I. The Diseased Plant. Vol. II. The Pathogen. Academic Press New York, 1959; 1960. Vol. I., XIV. 435 pages. Illustrated. $22.00. *Reviewed By Vincent Sauchelli.*

THE editors and the collaborating authors have produced a scholarly treatise on plant pathology. These books are designed for the creative researcher and not the beginning student. As the editors explain it, the treatise forms "a consistent body of theory which correlates the facts into a logical and explanatory system."

Volume I is concerned with the nature of disease in the plant, the scope and contributions of plant pathology, and with therapy of the diseased plant. Contrary to the common emphasis of recent books on plant pathology, these authors start with the diseased plant and not with the pathogens causing the disease.

Volume II deals with the causative factor, the pathogen itself, and on techniques for inhibiting it. Some sections also discuss parasitism and reproduction.

Many popular concepts about plant disease and its cause are forcefully analyzed and corrected. For example, it is shown that parasites and pathogens are not synonymous.

Among the array of distinguished scientists contributing to the two volumes are several authorities from foreign countries. It is good to see this participation of authorities from all over the world. Too often, scientific treatises are written from a narrow view-point.

These volumes are being acclaimed by plant pathologists everywhere. They deserve a place in the library of all agricultural research workers and institutions.

The Soil and Its Fertility by H. Teuscher and R. Adler. Reinhold Publishing Corporation. New York, N. Y., 1960. 446 pages. $12.00. *Reviewed by Vincent Sauchelli.*

Although the number of books on soil is legion, this book, with its refreshingly new approach, is a welcome addition to the list. The authors had both layman and scientist in mind when writing it. The unscientific gardener and farmer will have no difficulty in following the thread of the fascinating story of soil, its components, properties and actions in relation to plant growth, while the scientist will have abundant technical information to satisfy his demand for chemical and physical supporting data.

The book is divided into seven parts, each of which seems able to stand on its own, but yet the numerous cross references in each part knit the whole very satisfactorily. A glossary of scientific terms is appended for the lay reader.

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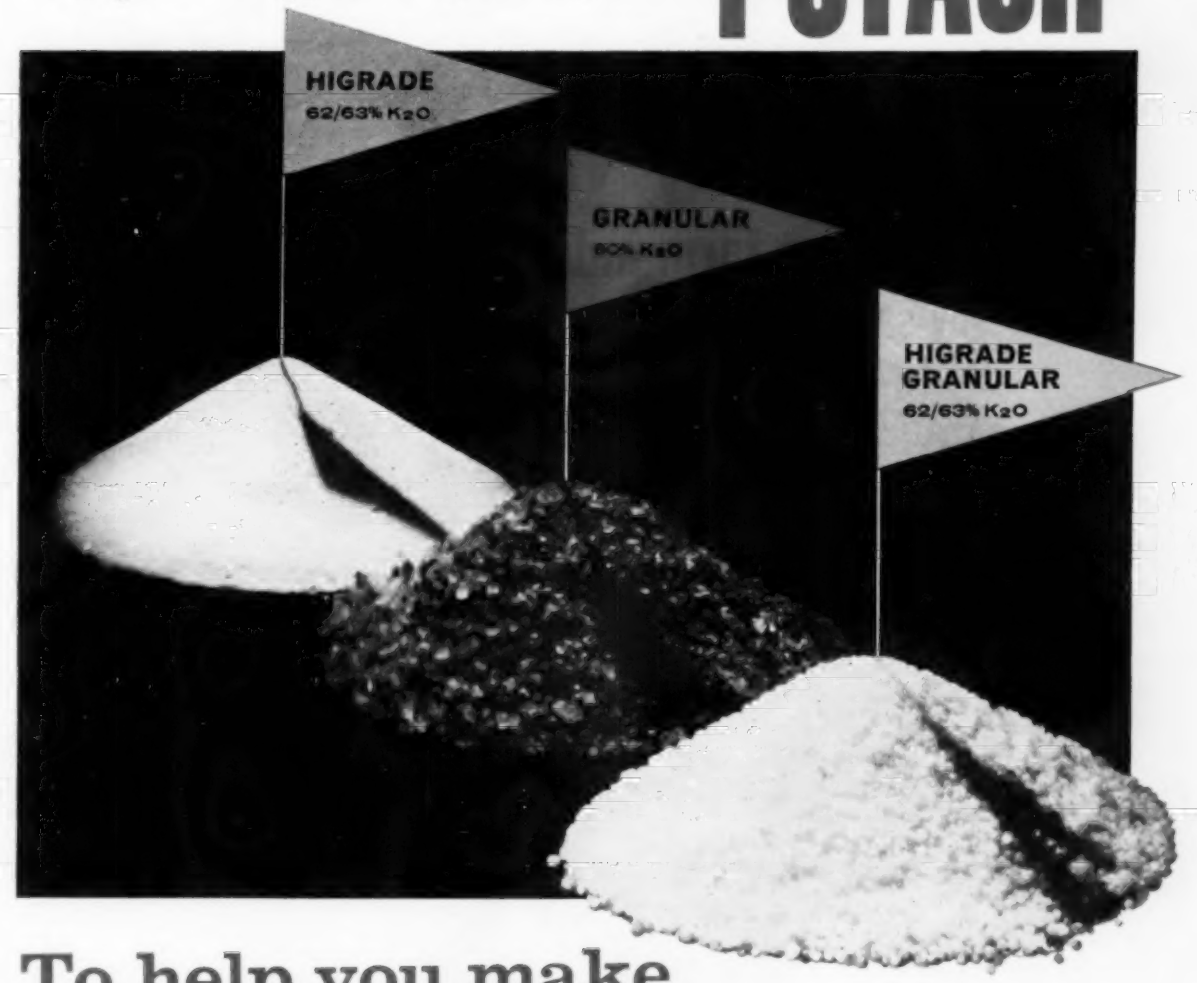

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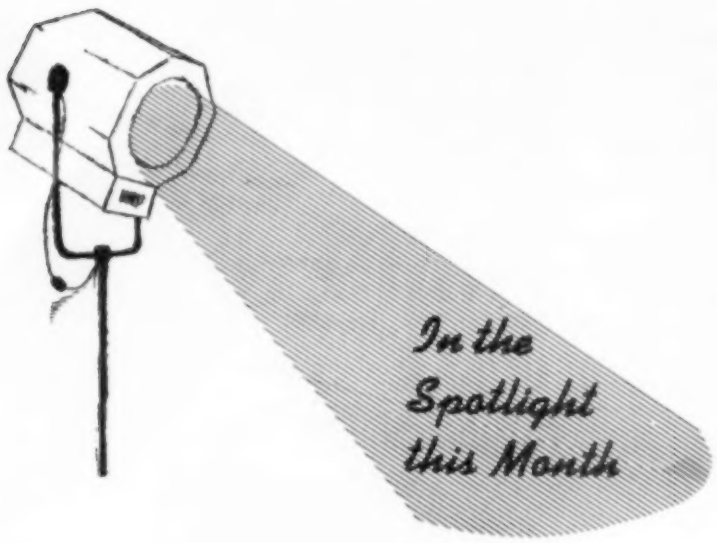

- **Fly Repellents** . . . Repellents have proved to be of value in dairy sprays. New and more effective repellents are being developed which promise to give control beyond that obtained previously with insecticides alone. Page 43.

- **Steam Granulation** . . . A technique of using steam in standard fertilizer mixing equipment to make a "granular-type" fertilizer is discussed in one of the reports before the American Society's Fertilizer Section. Other reports cover a plastic fertilizer conditioner, manufacture of ammonium polyphosphate fertilizer, and liquid fertilizer technology. Page 38

- **Chemicals and Food** . . . In a stong statement defending the important role of agricultural chemicals, Hon. Jamie L. Whitten, observes that a "ban on agricultural chemicals would reduce food supplies" crippling our entire economy. Speaking before NAC, the Congressman from Mississippi further observed that the "development of more effective pesticides is one of the reasons why it takes only 12% of our population to produce food and clothing for the remaining 88%. Page 48.

- **Fertilizer Consumption** . . . National consumption of fertilizer for 1958-59 reported at 25,312,672 tons, an increase of 11.7% over 57-58. Materials for direct application represent 36.5% of all fertilizers used. Page 45

- **Farmer Use of Pesticides** . . . The conclusion of a survey on farmer attitudes toward agricultural chemicals shows that although 92% of all farmers in Iowa used some agricultural chemicals, only 14% used crop insecticides . . . 87% were sold on the idea of weed killers. For all categories of agricultural chemicals, the use patterns are at a low level,—with low average dollar expenditures. Page 41

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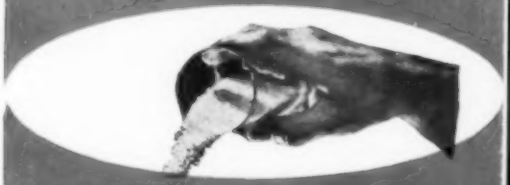

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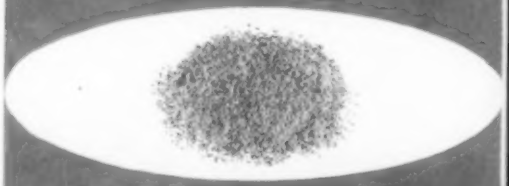

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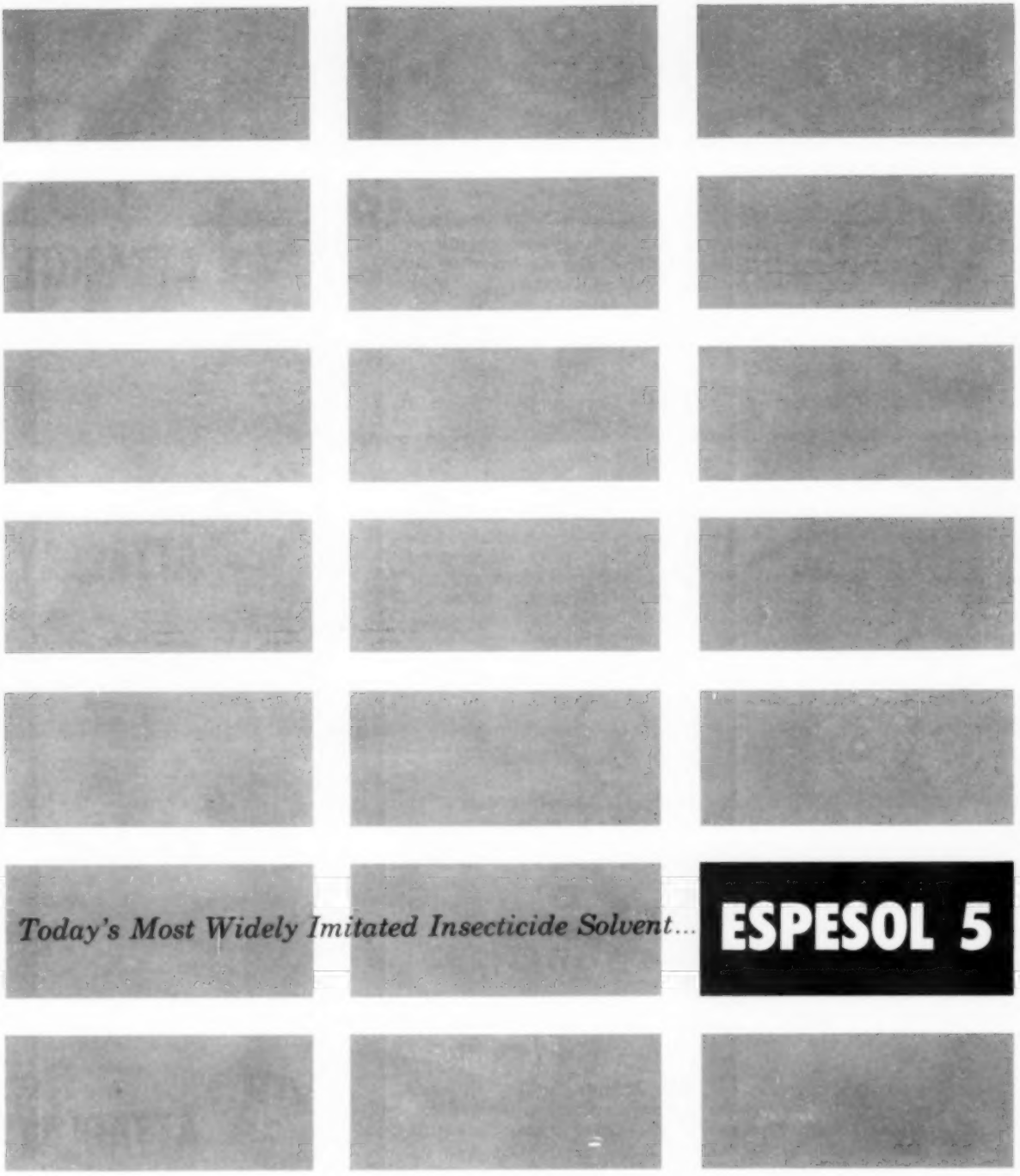

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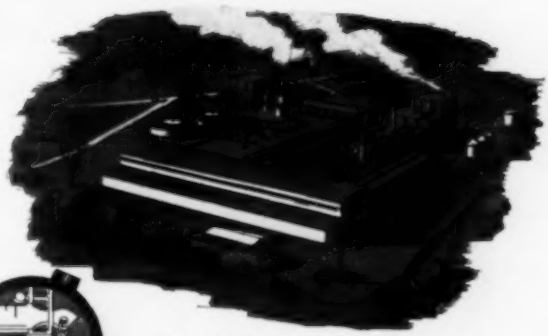

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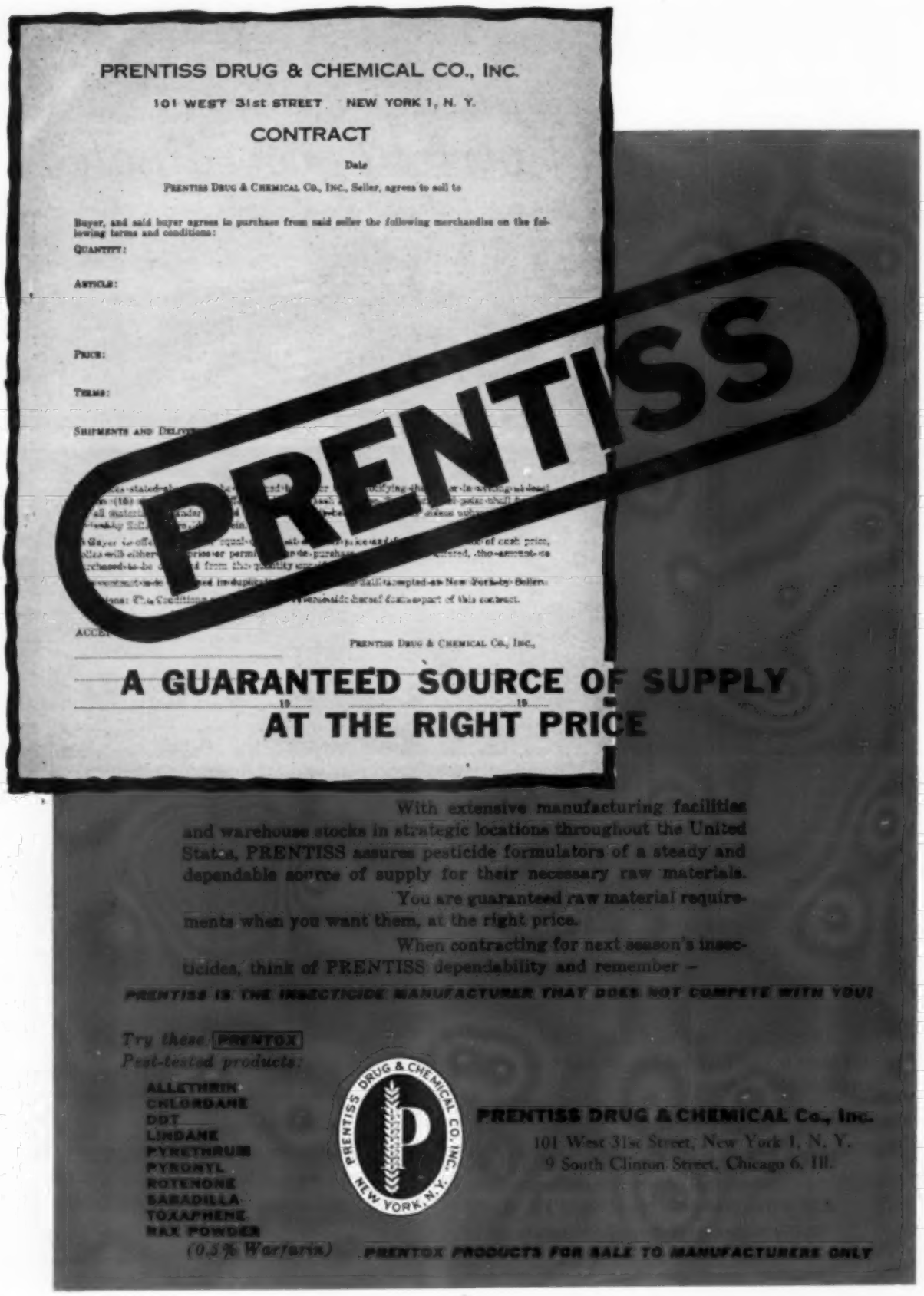
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INDUSTRY MEETING CALENDAR

Oct. 5-6—Southeast Fertilizer Conf., Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 10-11 — Four-State Aerial Applicators Conf., Hotel Chinook, Yakima, Wash.

Oct. 10-12 — Association Official Agricultural Chemists, Shoreham Hotel, Washington, D. C.

Oct. 13-14 — Association of American Fertilizer Control Officials, Shoreham Hotel, Washington, D. C. (States' Relations Committee Meets at 8:15 p.m., Oct. 13).

Oct. 17-18—Fertilizer Section, National Safety Congress, Chicago.

Oct. 27-28 — Eastern Branch Entomological Society of America annual meeting, Hotel New Yorker, N. Y.

Nov. 3-4—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 3-4 — Pacific Northwest Plant Food Assn., Annual Convention, Boise, Idaho.

Nov. 9-11—National Fertilizer Solutions Association, Annual Convention, Peabody Hotel, Memphis, Tenn.

Nov. 10-13 — Texas Aerial Applicators Association, Annual Convention, Echo Motor Hotel, Edinburg, Texas.

Nov. 13-15 — California Fertilizer Assn., del Coronado Hotel, Coronado, Calif.

Nov. 14 — Salesmen's Association of the American Chemical Industry, Annual Sales Clinic, Roosevelt Hotel, New York.

Nov. 14-19—Mexican Association of Insecticide and Fertilizer Manufacturers, annual convention, Merida, Yucatan, Mexico.

Nov. 21—South Carolina Plant Food Educational Society, annual meeting, Clemson House, Clemson Agricultural College, Clemson, S. C.

Nov. 28-30 — Soil & Crop Science Society of Florida, Annual Meeting, Fort Harrison Hotel, Clearwater, Fla.

Nov. 28-Dec. 1—Entomological Society of America, 8th Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J.

Nov. 29-Dec. 1 — New York State Nurserymen's Association, annual convention and trade exhibition, Concord Hotel, Kiamesha Lake, N. Y.

Nov. 30 — New Jersey annual fertilizer conference, Rutgers University, New Brunswick, N. J.

Dec. 5-7—Carolinas-Virginia Pesticide Formulators Assn. annual meeting, Carolina Hotel, Pinehurst, N. C.

Dec. 5-9—American Society of Agronomy, Annual Meeting, Morrison Hotel, Chicago.

Dec. 6-8—National Aviation Trades Association, annual convention, Oklahoma Biltmore Hotel, Oklahoma City, Oklahoma.

Dec. 12-14 — North Central Weed Control Conference, Hotel Schroeder, Milwaukee, Wis.

Jan. 4-6—Northeastern Weed Control Conference, Hotel New Yorker, New York.

Jan. 5-7 — California Aerial Applicators Association, 11th Annual Convention, El Dorado Hotel, Sacramento, Calif.

Jan. 10-11—Fertilizer Dealers Short Course and Fertilizer Industry Representatives Conference, Memorial Union, Iowa State University, Ames, Iowa.

Jan.12-13 — Arizona Aerial Applicators Association, 8th Annual Meeting, The Wigwam, Litchfield Park, Ariz.

Jan. 19-21—Mississippi Aerial Applicators Association, annual convention, Buena Vista Hotel, Biloxi, Miss.

Jan. 23-25 — Southeastern Branch, Entomological Society of America, annual meeting, Admiral Semmes Hotel, Mobile, Ala.

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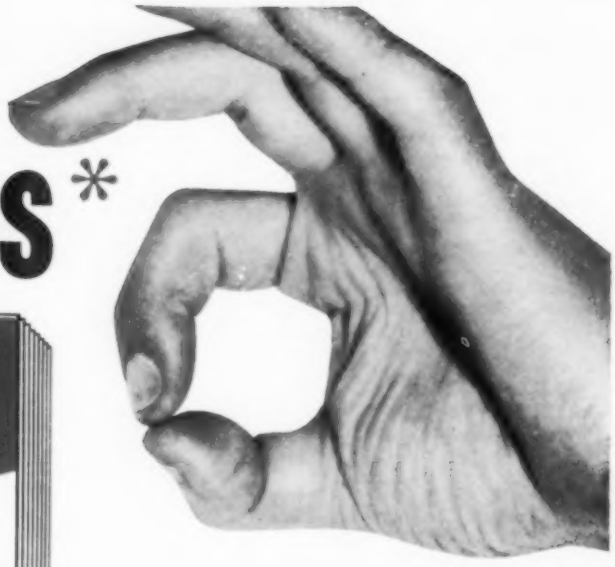
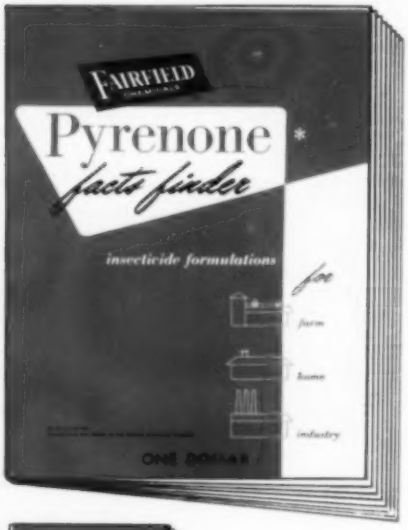
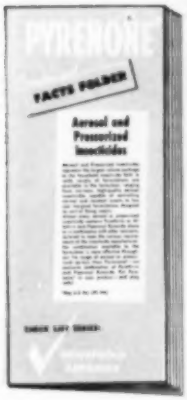






a library of vital technical data to guide insecticide formulators, manufacturers, PCO's and sanitarians

Designed to aid makers of pesticides in virtually every area of application . . . in the home, food handling and processing, grain storage, post-harvest, dairy, livestock and aerosols, etc.

Included are fool-proof, use-proven basic formulations that contain Pyrenone†, Fairfield's own non-toxic piperonyl butoxide and pyrethrins insecticide base.

Here is a partial list of Fairfield technical aids to help you "tailor make" *a more effective, more economical, more profitable product.*

- ☐ House & Garden Products
- ☐ Dairy Sprays
- ☐ Residual Concentrate
- ☐ Aerosols & Pressurized Insecticides
- ☐ Fly Repellent Combinations
- ☐ Industrial Type Aerosols

* *Ask your Fairfield representative for these and other aids, or write.*

†Reg. U.S. Pat. Off. FMC

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION

Fairfield Chemicals

Sales Headquarters

441 LEXINGTON AVENUE, NEW YORK 17, N.Y.

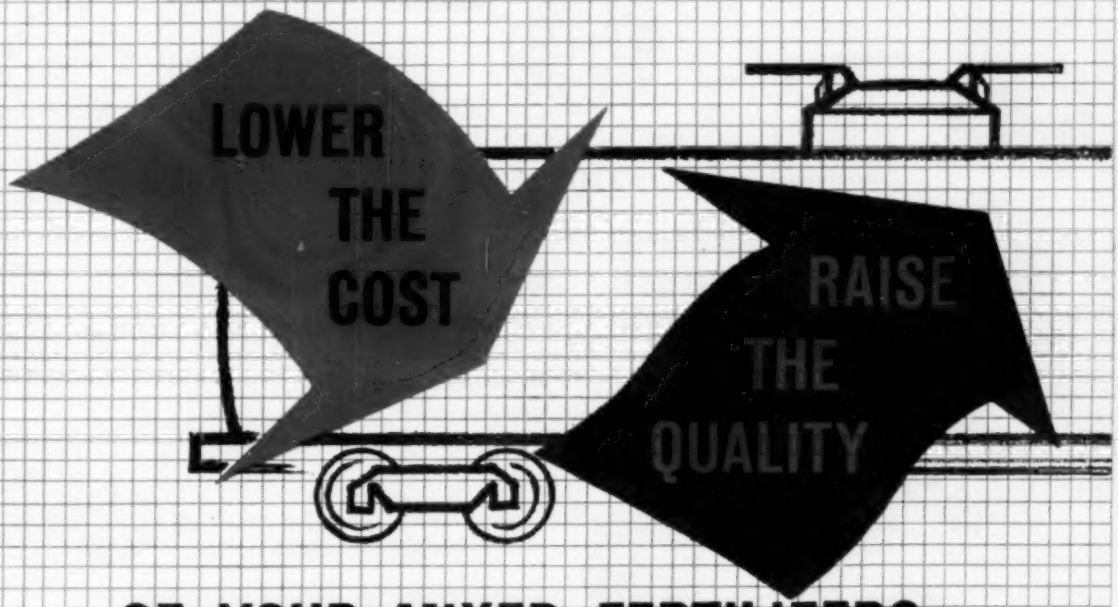
Branches in principal cities. In Canada: Natural Products Corporation, Montreal and Toronto.

fmc FOOD MACHINERY AND CHEMICAL CORPORATION ®

DRI-SOL

ADVANCED, NEW NITROGEN SOLUTIONS

developed by Commercial Solvents Corporation



OF YOUR MIXED FERTILIZERS

It's a pleasure to tell you about the new, exclusive (patents pending) DRI-SOL Nitrogen Solutions. This new line represents a significant advancement in ammoniating solutions. In making mixed fertilizers, you will find the performance of these solutions quite impressive. You can count on at least 7 distinct benefits:

1. Reduced shipping costs. 2. Better process control in continuous ammoniation. 3. Lower formulation costs. 4. Lower drying costs, increased dryer capacity, or a drier product. 5. Increased plant capacity. 6. Faster curing and quicker shipment. 7. Improved quality of both conventional and granular fertilizer.

In addition to these 7 advantages, you may find still other ways in which these unique DRI-SOL solutions can be useful to you. For example, these solutions can be used to help offset the high water content of low strength acid, or to produce those grades which are difficult or impossible to make with conventional solutions.

CSC's DRI-SOL Nitrogen Solutions are available in grades ranging from 24% ammonia and 76% ammonium nitrate to equal parts by weight of ammonia and ammonium nitrate. This new line of solutions is essentially anhydrous. Water content: about 0.5%.

DRI-SOL solutions are generally available in the Southern and Midwestern States. Technical literature available to fertilizer manufacturers.

AGRICULTURAL CHEMICALS DEPARTMENT

COMMERCIAL SOLVENTS CORPORATION CSC

260 Madison Avenue, New York 16, N. Y.

★Please send me technical data on CSC's new DRI-SOL Nitrogen Solutions. The solutions numbers I am currently using are:_____

The bulk of my mixed goods tonnage is made up in the following grades:_____

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____

STATE_____

They all picked

All these famous firms have one thing in common: They operate Union I & C Baggers. And their number is increasing each year. Two I & C users now operate 68 machines. Another recently converted twelve of its plants to I & C Baggers. Hundreds of units have been installed throughout industry—in the last four years alone!

This trend to Union's I & C Bagger began almost as soon as the unit was introduced. The first completely automatic pre-weighing machine for open mouth bags, Union's I & C Bagger made possible great savings for the farm, food and chemical product industries—savings in increased production and reduced labor, and savings through the use of a lower cost bag. And the I & C was the first machine designed specifically for ease of installation—featuring lower head room and requiring floor space of only 5′ x 5′.

Regardless of the size of their operation, manufacturers and processors immediately found that Union's I & C Bagger was a practical, profitable investment. The trend began . . . and still continues. Though much imitated, Union's I & C Bagger is still specified time after time by leading packers of free-flowing materials.

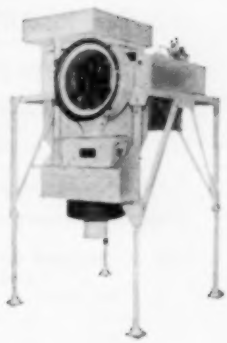
Like these firms, you'll find that the savings achieved with Union's I & C Bagger will pay

Union's I&C Bagger!

for its cost in a remarkably short time.

Service within hours

Every I & C Bagger installation is backed up by Union's staff of field service experts—geographically located to give you the fastest possible service. There's always a Union representative available for consultation on bagging methods and equipment. *Write for illustrated booklet describing the complete line of I & C Baggers and auxiliary equipment.*



UNION's I & C BAGGER

Automatic weighing and filling machine for open mouth bags. Manufactured by Inglett & Company, Inc., Augusta, Georgia.

UNION-CAMP®

PACKAGE ENGINEERING

Union Bag-Camp Paper Corporation · 233 Broadway N.Y. 7, N.Y.

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"BOM DIA . . . Woodward & Dickerson"

" . . . Woodward & Dickerson"

"KUMUSTA KAYO . . . Woodward & Dickerson"

"BONJOUR . . . Woodward & Dickerson"

"BUENOS DIAS . . . Woodward & Dickerson"

"GOEDEN DAG . . . Woodward & Dickerson"

" . . . Woodward & Dickerson"

"GUTEN TAG . . . Woodward & Dickerson"

" . . . Woodward & Dickerson"

"BUON GIORNO . . . Woodward & Dickerson"

"GOD DAG . . . Woodward & Dickerson"

"ALOHA . . . Woodward & Dickerson"

All over the world, in any language Woodward & Dickerson is well known for buying and selling . . .

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MINERAL SUPPLEMENTS
MIXED FERTILIZERS
NITROGENOUS FERTILIZERS
PHOSPHATE ROCK
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SUPER PHOSPHATES

AND ALL OTHER FERTILIZER AND FEED MATERIALS

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Cable Address: "Woodward", Teletype: PH109
Branches in HAVANA, MANILA, TOKYO, SEOUL, MEXICO CITY, WASHINGTON, D. C., U.S.A.

Terra-Lite formulates easily without caking or balling, even at high concentrations.

Terra-Lite®

THE WONDER MINERAL

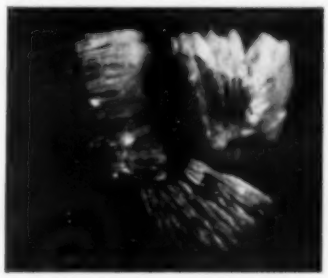
LOW COST

...Fertilizer Conditioner ...Granular Carrier

Now put an end to bulky, hard-to-handle, fire-hazardous conditioners and carriers. Terra-Lite is clean, light in weight, conveniently packaged, fireproof. It's uniformly graded, sterile, free of contaminants. Readily available 12 months of the year from over 40 plants in the U.S. and Canada.

As a conditioner, Terra-Lite reduces caking problems for fertilizer manufacturers, ends customer complaints. Easy to mix, easy to handle. Cost to condition a ton is amazingly low.

As a carrier for insecticides, herbicides, or nematicides, Terra-Lite allows formulation of much higher concentrates. This gives greater coverage in the field, saves on formulation, shipping and packaging.



Magnified view of granules shows many-celled structure which makes Terra-Lite an ideal carrier.

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comprehensive data folder, name of nearest Distributor

Terra-Lite®

BRAND VERMICULITE

TERRA-LITE DIV., Zonolite Company, Dept. ACB-100
135 S. La Salle St., Chicago 3, Ill.

Send me free inspection sample of Terra-Lite vermiculite, and formulating instructions.

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Firm_____
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Sell and use these outstanding products... from Geigy Research

DIAZINON INSECTICIDE
Versatile effective organic phosphate insecticide for long residual fly control, multiple insect control on most fruit and vegetable crops. Extensively used by PCO industry for control of roaches and other household insects. May be formulated for household insect sprays.

SIMAZINE HERBICIDE
Pre-emergence herbicide for use on corn. One application gives season-long effective weed control. Safe to corn. Performs best in areas where rainfall is normally expected 10 to 14 days after planting. Also for pre-emergence use on nursery stock, and at higher levels of application, as an industrial herbicide. Extremely low toxicity to humans and animals.

Geigy
METHOXYCHLOR INSECTICIDE
Multi-purpose insecticide. Long residual action against many insect species attacking fruit, vegetable, forage crops, and stored grain. Controls horn flies, cattle lice and ticks on livestock.

ATRAZINE HERBICIDE
New pre-emergence herbicide for use on corn. Higher solubility than Simazine. Recommended especially for use in drier areas. One application provides season-long weed control. Safe to corn. Extremely low toxicity to humans and animals. At higher dosage rates, Atrazine is used as a non-selective **pre- or post**-emergence herbicide for industrial weed control.

CHLOROBENZILATE MITICIDE
Safe, effective miticide for use on deciduous and citrus fruit, ornamentals and nursery stock. Long residual action.

SEQUESTRENE® METAL CHELATES
Original metal chelates in agriculture. For correction of minor element deficiencies of ornamentals, fruit trees, vegetables, turf. Compatible with most commonly used insecticides, fungicides, fertilizers.

Geigy ORIGINATORS OF DDT INSECTICIDES

GEIGY AGRICULTURAL CHEMICALS • *Division of Geigy Chemical Corporation* • Saw Mill River Road, Ardsley, N.Y.

Non-caking, free-flowing fertilizers mean . . .

SATISFIED CUSTOMERS

SPECIFICATIONS	AC*	51**
Minimum % Thru 325 Mesh (Wet)	94	94
Minimum % Thru 200 Mesh (Wet)	97	97
Average Particle Size, Microns (Fisher)	0.8	0.8
Moisture, Maximum %	4.0	6.0
Bulk Density lbs/cu. ft. (Scott)	7.0	8.0
Surface Area, cm^2/gm, Average	40,000	40,000
Brightness	70	70

*For ammonium nitrate.
**For high-analysis fertilizers.

IMMEDIATE SHIPMENT BY THE CARLOAD

DIATOMITE

KENITIZE

your fertilizer!

KENITE CORPORATION

Overhill Building — Scarsdale, New York

Send for Literature

SCarsdale 3-8110

Market more profitable fruits and vegetables...

protect them with Penick's

POWDERED CUBE!

Because of its outstanding safety and effectiveness, Penick's powdered cube continues to enjoy wide popularity as a general-purpose agricultural insecticide dust.

It effectively controls vegetable weevil, Japanese beetle, raspberry cane borer and many other chewing and sucking insects. Penick's powdered cube won't injure fruits and vegetables and may be used within days of harvest without fear of harmful residues.

Penick's complete line of rotenone formulations includes brittle extract of cube, emulsifiable rotenone 5%, and many special concentrates.

We will be pleased to send samples, suggested formulations and technical data.

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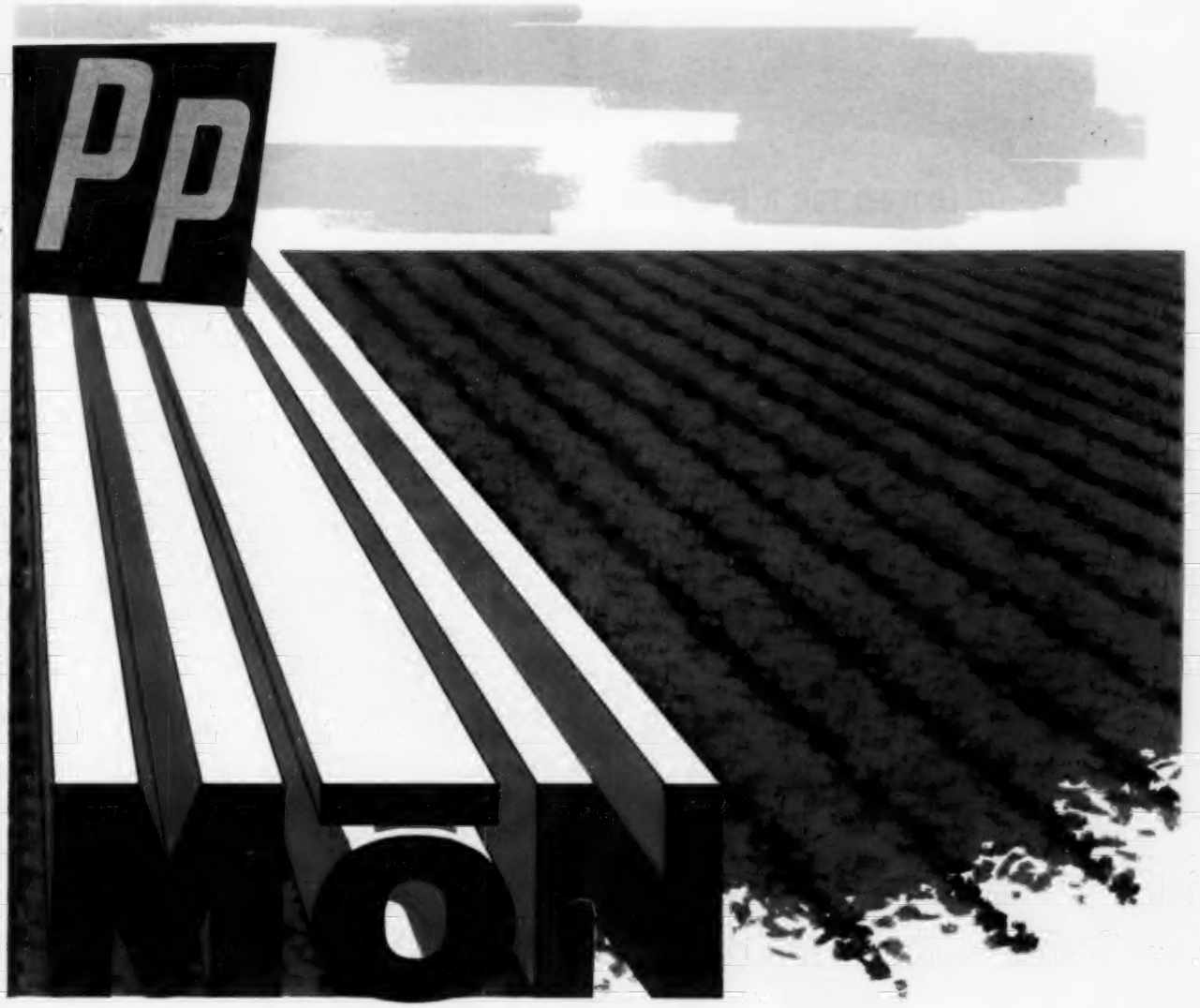
For production of high and ultra-high analysis fertilizers which cannot be produced with conventional materials.

The Country's Largest and most Dependable Source of Phosphate Products for High Analysis Formulations!



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For further information and your requirements–Contact Our

Sales Agents **BRADLEY & BAKER**

U.S. PHOSPHORIC PRODUCTS

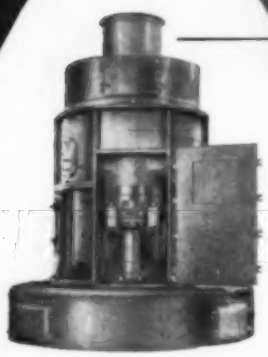
TAMPA, FLORIDA

Division

TENNESSEE TC CORPORATION

LOOKING FOR A FINE GRIND WITHOUT INVOLVED MAINTENANCE PROBLEMS?

Then you're looking for a Bradley Pneumatic Hercules Mill. Because the Bradley Pneumatic Mill is installed on a foundation flush with the floor line, it not only reduces foundation costs but simplifies inspection and maintenance. Grinding parts are also easily accessible . . . both grinding die ring and roll assemblies can be removed without dismantling the mill. And the mill's durable, nonclogging vibratory feeder and electrical control eliminate manual feeding . . . allow continuous operation of the mill. Add rugged construction to this, and you have a mill which produces a uniform grind from 20 to 325 mesh with an absolute minimum of replacements and downtime.



BRADLEY PNEUMATIC HERCULES MILLS

See Chemical Engineering Catalog or for complete information, write for Catalog No. 63

BRADLEY PULVERIZER CO.
superior grinding equipment since 1891

LONDON ALLENTOWN, PA. BOSTON

Agricultural insight creates...

new dimensions in service from Sohio

"We're serious about *service*" is far more than just a slogan at Sohio, supplier of nitrogen materials for the fertilizer industry. It's a genuine feeling of responsibility to serve your nitrogen needs as completely and as efficiently as we know how.

One vital aspect of Sohio service is *planning ahead* . . . developing improved nitrogen materials, improving services and supporting activities that will benefit the entire fertilizer industry.

In 5 short years at Sohio, this agricultural insight to the needs of the fertilizer manufacturers has led to the development of:

- New solutions with higher nitrogen content . . . less water.
- Higher fixed-to-free ratio solutions.
- Addition of optimum amounts of urea to lower saturation temperatures.
- Solutions adapted to preneutralization.
- Technical assistance and service in using more solutions in making fertilizers.

For more about Sohio service and products, call the "Man from Sohio." He's your link with Sohio's full line of quality nitrogen materials: anhydrous ammonia . . . aqua ammonia . . . coated 45% or uncoated 46% urea . . . 18 nitrogen solutions, including all urea types.

SOHIO

. . . we're serious about SERVICE at Sohio

SOHIO CHEMICAL COMPANY

Agent for Solar Nitrogen Chemicals, Inc.

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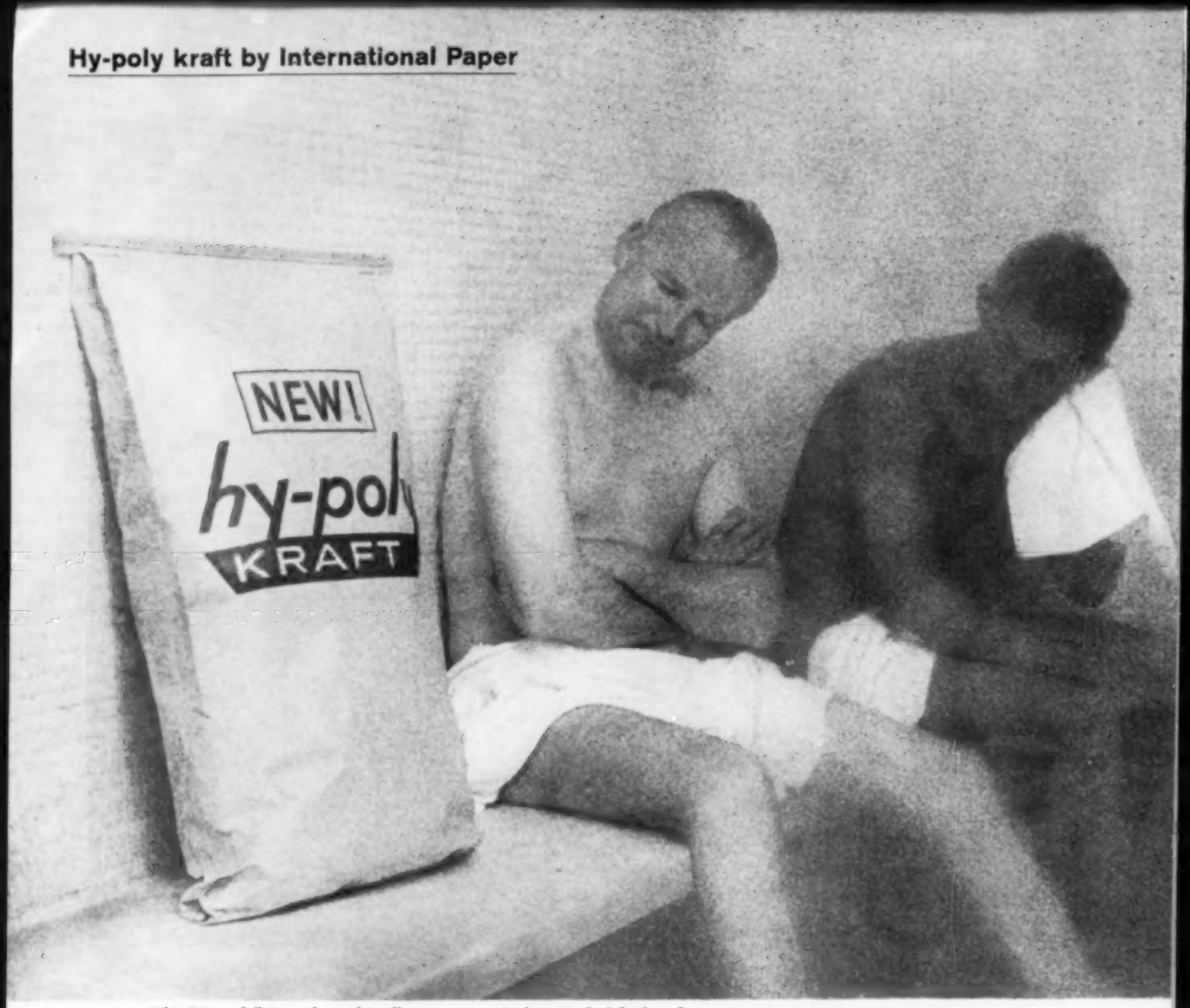
Phone CApitol 5-8015 or wire (TWX call letters LIMA O 497-U)

18R-60

Hy-poly kraft by International Paper



This "Hy-poly" Bagpak® multiwall was given a 360-hour Turkish bath to demonstrate its moisture-resistant properties.

Trial by steam bath!

Read how new humidity-proof Hy-poly kraft makes medium- and low-density polyethylene sheets extravagant by comparison.

THE multiwall bag in our picture is made of Hy-poly kraft. It contains *calcium chloride*.

International Paper steamed this multiwall in 90% relative humidity at 100° F. for 360 hours! (Unprotected, under these conditions, calcium chloride takes on 2½ times its weight in water in about an hour.)

But when the bag was opened, the thirsty crystals spilled out as though they had been stored in the middle of the Sahara!

Bagpak's Hy-poly kraft is not only humidity-proof. It *saves money*, too. Savings range from $2 to $16 per thousand multiwalls.

Hy-poly kraft is so superior to medium- and low-density PE sheets that you get equal, if not greater, moisture-vapor protection from a coating about *half as thick!*

This dramatic new barrier sheet is a product of 62 years of papermaking and packaging experience. It is only part of a *complete* multiwall packaging service offered to you by International Paper.

Whatever your multiwall packaging needs, it will pay you to talk to your Bagpak packaging engineer. He has complete information. It's yours for the asking.

INTERNATIONAL PAPER
BAGPAK DIVISION · NEW YORK 17, N. Y.

Bo Weevil never had a chance against Frontier

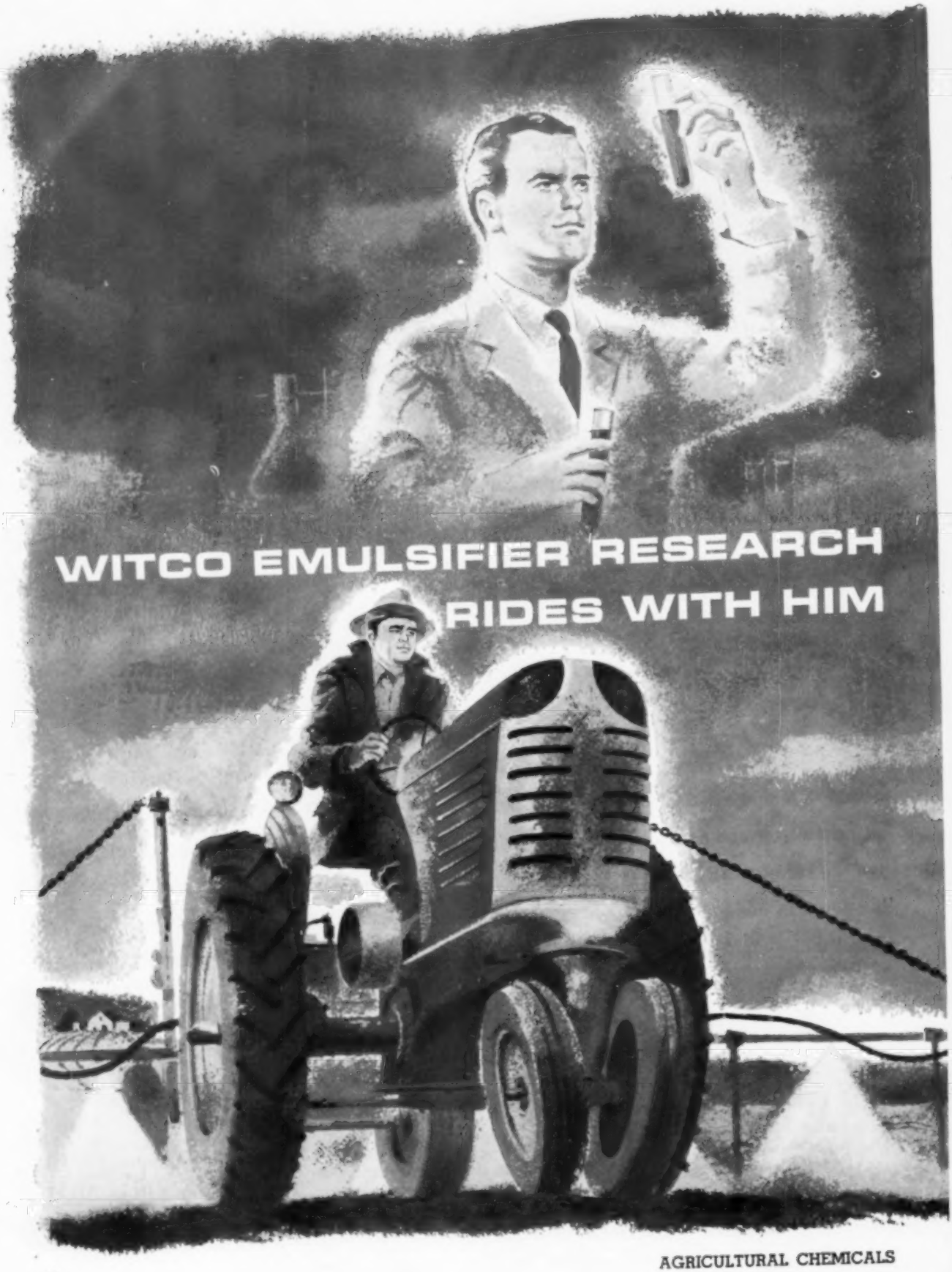
BHC

ANOTHER season brings the same old story — Bo Weevil meets his match in Frontier BHC. He never had a chance! For BHC, properly applied, is still the surest and most economical way to control weevil infestations in all stages of growth. It's the safest of all effective controls, too. And its residual effects last longer. Frontier BHC is offered in low gamma or high gamma concentrations, whichever you need. Both are produced under rigid quality control in Frontier's advanced new plant, and thoroughly seasoned to give you a product that's easy to work with. Be safe, be sure — contract for Frontier BHC.

FRONTIER CHEMICAL COMPANY

division
VULCAN MATERIALS COMPANY

P. O. BOX 545 WICHITA, KANSAS


WITCO EMULSIFIER RESEARCH
RIDES WITH HIM

It's not yet Spring when Summer's work begins. Pre-emergence toxicants make possible an early start... a more profitable finish. And Witco research has created Witco Emcol Emulsifiers which perform outstandingly under the normal range of field temperatures. Formulators know how important this kind of performance is to sales.

Through the years, Witco research has made Emcol Emulsifiers increasingly attractive to formulators. Their excellent quality allows the use of reduced emulsifier levels. Their extreme versatility makes possible the use of but three Emcols to produce top-quality emulsifiable concentrates of a wide range of chlorinated hydrocarbon and organic phosphate toxicants. In addition, these emulsifiers produce concentrates which have excellent storage stability.

The many basic emulsifier patents held by Witco in more than 15 countries indicate the success of our research efforts in this ever-changing area of chemistry. Witco's technical service program makes available our extensive research facilities and highly trained specialists to help solve your formulating problems.

EMCOL	DESCRIPTION
H-300X H-500X	Emcol H-300X is balanced for toxicants in the lipophilic range (i.e., toxaphene and chlordane), while H-500X is ideal for more hydrophilic toxicants (i.e., DDT and BHC). Blends of this Emcol-matched pair produce superior emulsifiable concentrates with chlorinated hydrocarbon and organic phosphate insecticides.
H-710 H-712 H-714	Manufactured for use with 2,4-D and 2,4,5-T ester concentrates, at low levels, these products give low-foam concentrates outstanding emulsification and sludge-inhibiting properties.
H-140 H-141	Especially developed for use with Malathion, these Emcols may be blended with other Witco emulsifiers or used alone. H-140 produces excellent emulsifiable concentrates containing 5 pounds per gallon of Malathion (approx. 60% Malathion by weight). Emcol H-141 is recommended where levels of 8 pounds per gallon (approx. 86% Malathion by weight) are desired.
H-A H-B H-C	These unique Emcols make practical simultaneous application of a wide variety of liquid fertilizers—liquid pesticide mixtures. Such mixtures may be field-blended to give exactly the correct proportions of toxicant and fertilizer as well as correct dosages for particular crops.

Divisions of WITCO CHEMICAL COMPANY

ORGANIC CHEMICALS DIVISION

RUBBER CHEMICALS DIVISION

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CANADA

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122 East 42nd St., New York 17, N. Y.

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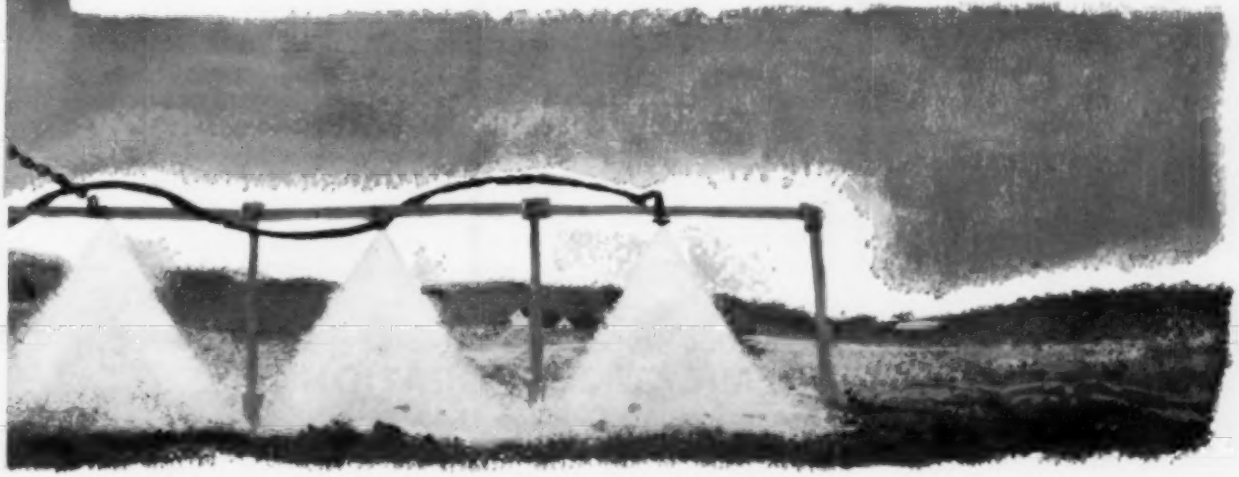


VELSICOL

INSECTICIDE OUTLOOK for 1961:

plans, promotions, and favorable trends indicate
expanded sales opportunities for formulators!

HEPTACHLOR

...growing demand!

Extensive tests conducted by leading experiment stations prove that Heptachlor can't be beat for effectiveness in control of soil insects. Demand for Heptachlor continues to grow. In 1961, you will see more intensive advertising to capture even more sales. Besides major regional and state media, Heptachlor will be promoted in hundreds of local newspapers and billboards.

ENDRIN

...branching out!

Endrin is relatively new, in terms of uses and acceptance. 1960 saw the development of many new Endrin markets. Apples, potatoes, cotton and many other crops were widely treated with Endrin during the past year. The use of Endrin-Methyl Parathion mixtures for cotton insect control proved especially popular and effective. In 1961, you can anticipate a big Endrin demand in all markets, helped along by strong promotional programs keyed to local requirements.

CHLORDANE

...better than ever!

If they held popularity contests for insecticides, Chlordane would win the gold cup every year. Lawn and garden use has risen sharply as Chlordane has become established in crabgrass control. Chlordane is preferred because of its unmatched safety and performance record. 1961 promotional plans call for greatly increased local advertising, more national advertising, sales promotion and educational materials, and many other innovations.

WATCH FOR MORE DETAILS ON VELSICOL INSECTICIDE SALES SUPPORT PROGRAMS!

VELSICOL

VELSICOL CHEMICAL CORPORATION

330 East Grand Avenue, Chicago 11, Ill.

Velsicol International Corporation, C. A., P. O. Box 1687—Nassau, Bahamas, B.W.I.

VC 3436-076

AC-100

ELEMENTARY...IT'S A EXTENSIBLE CLUPAK® PAPER* MULTIWALL BAG ...THAT'S WHY IT WON'T BREAK!

New CLUPAK extensible paper makes other papers old-fashioned . . . makes multiwall bags that stretch to take strain . . . absorb shock that causes bag damage. This increased toughness allows multiwall sack users to increase strength yet decrease the number of plies with resulting economies. Specify CLUPAK extensible paper multiwalls the next time you order.

You benefit three ways. One, you eliminate burst-bag waste, because CLUPAK extensible paper absorbs shock . . . stretches instead of tearing. Two, you increase storage efficiency. CLUPAK extensible paper permits safe, clean, more compact stacking, less re-stacking. Third, you simplify on-the-job handling. Your workmen do not have to "baby" multiwalls made with CLUPAK extensible paper. The next time you order, say, "CLUPAK"... before you say paper.

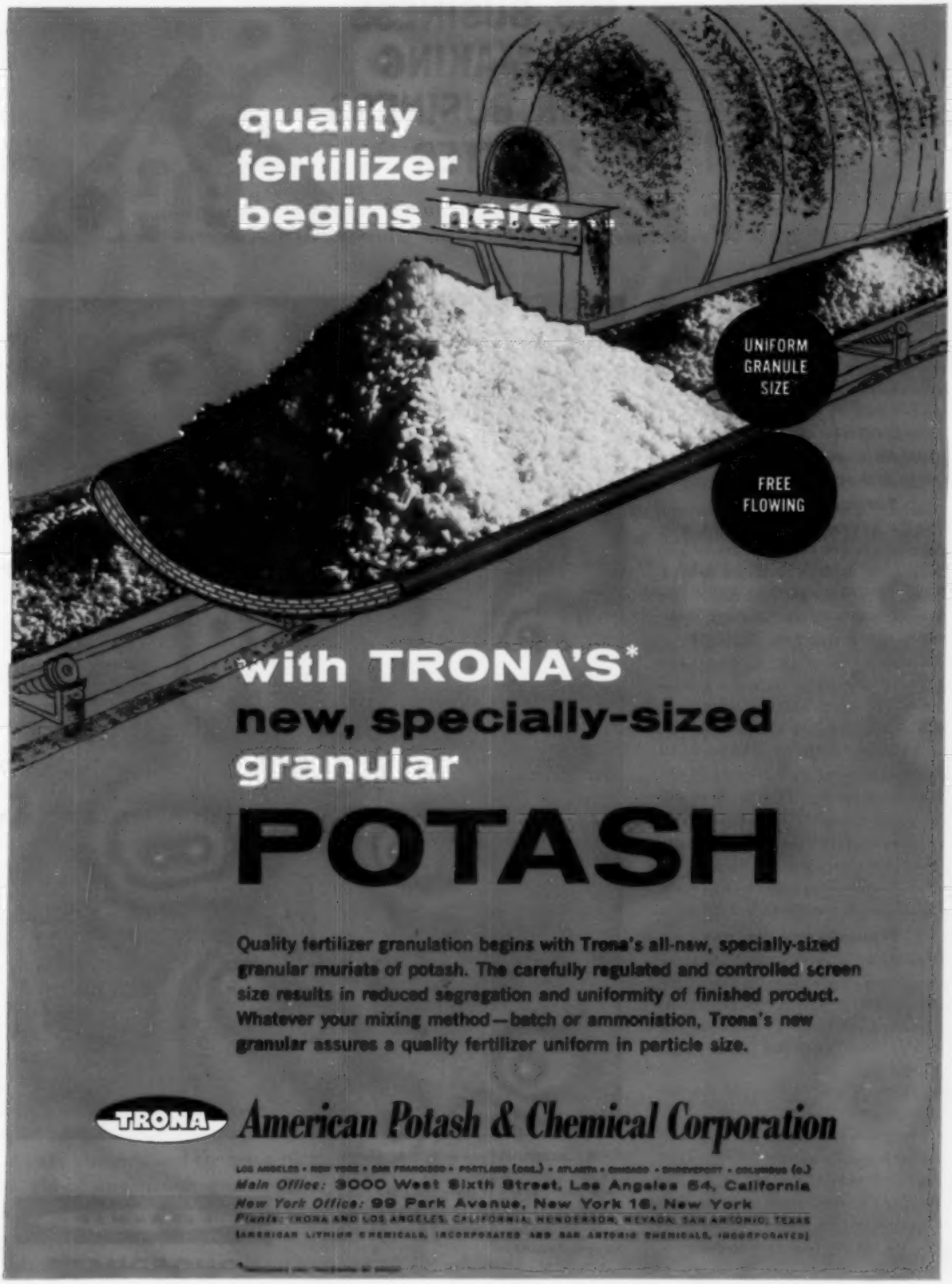
*Clupak, Inc.'s trademark for extensible paper manufactured under its authority and satisfying its specifications. Clupak, Inc., 530 5th Ave., N. Y. 36, N. Y.

Ernie Herrbach stands guard ***over the quality of Anhydrous Ammonia and Nitrogen Solutions you buy***

Ernie Herrbach has more than a night stick to help him guard the quality of NH_3 and Nitrogen Solutions Standard Oil delivers. He has: (1) One of the most modern NH_3 and Solutions plants in the business to supply them. (2) Perhaps the largest quality control laboratory in the Midwest to back him up. (3) More than 20 years' experience in marketing and technical service work in agricultural chemicals plus agronomy training and a degree in horticulture from Michigan State University to help him know and understand a customer's needs. (4) Support from a company with 70 years' experience supplying customers with products they need.

You'll like the help Ernie Herrbach gives you on your order for Anhydrous Ammonia or Nitrogen Solutions. To get it, just call **Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Ill.**

You expect more from **STANDARD** *and you get it!*


quality
fertilizer
begins here...
UNIFORM
GRANULE
SIZE
FREE
FLOWING
with TRONA'S*
new, specially-sized
granular
POTASH
Quality fertilizer granulation begins with Trona's all-new, specially-sized granular muriate of potash. The carefully regulated and controlled screen size results in reduced segregation and uniformity of finished product. Whatever your mixing method—batch or ammoniation, Trona's new granular assures a quality fertilizer uniform in particle size.
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Plants: TRONA AND LOS ANGELES, CALIFORNIA; HENDERSON, NEVADA; SAN ANTONIO, TEXAS
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HIS BUSINESS IS MAKING YOUR BUSINESS BETTER

Like all the men and women in Cyanamid's phosphate operation, his only business is phosphates for your mixed fertilizers

He's one of several hundred Cyanamid people who mine, process, research, deliver and service phosphatic materials for your acidulation and mixed fertilizer business. These people put Cyanamid's more than 40 years of phosphate experience into products and services you can use.

Services you can use

Traffic Service: Cyanamid traffic specialists are ready to route and ship your orders without delays. Their knowledge can save you money and can make your operation run even more efficiently.

Technical Service: Cyanamid's staff of technical experts are on 24-hour alert. Often, what are new problems to you are solved problems to them. Make your formulation and production problems theirs. That's their job.

Sales Service: Cyanamid sales representatives are available to work with and for you in expanding present markets or in establishing new markets.

Products you can use

Cyanamid's only phosphate business is manufacturing the highest quality products for your mixed fertilizer requirements.

- Florida Natural Phosphate Rock.
- TREBO-PHOS® — Triple Superphosphate.
- Phosphoric acid for acidulation.

American Cyanamid Company, Agricultural Division, N. Y. 20, N. Y. **TREBO-PHOS is American Cyanamid Company's trademark for its triple superphosphate.*

This Cyanamid technician is checking the flow and quality of phosphate rock just before it goes into the cone where it is mixed with phosphoric acid to make Trebo-Phos Triple Superphosphate.

CYANAMID

PHOSPHATE PRODUCTS

CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE

EDITORIALS

REP. Jamie L. Whitten (D. Miss.) in an address on "Chemicals and the Food Supply" at the recent meeting of the National Agricultural Chemicals Association in Coronado, Calif., presented the most thorough, best documented and convincing arguments we have heard to support the essential role of agricultural chemicals in protecting the nation's food supply. He observes that, according to U.S.D.A. officials, "if it were not for the use of chemicals, fertilizers and pesticides, in five years the cost of a very inferior quality of food to the American consumer would double; and in ten to fifteen years the people of the United States would be short of essential foods."

Discussing the idea of "zero tolerances," he puts his finger on the essential inconsistency with the observation that "to insist upon any such thing as zero tolerance, would rule out the air we breathe and even the water we drink. Actually to follow any such policy would greatly endanger all of us, as a result of the contaminated, scarce and poor quality food which would be available under such a policy."

Rep. Whitten deplores the fact that legislators, editors, radio and TV figures and others are ignoring the national interest and doing an injustice to the farm community through "efforts to curry favor with the 88% of our people who are non-farmers." Acclaiming the product of American farms as "the safest, the most nutritious, the cheapest and the most plentiful that the people of any nation ever enjoyed throughout history," he demands that "we must not permit anyone to endanger the public health of the future by prejudicing public opinion against the very means which makes our ample supplies of wholesome and nutritious food available."

SOME highly significant observations on the American fertilizer industry were highlighted in figures which originated from two different sources over the past month. First, the annual report of the U. S. Department of Agriculture indicated that there were 1,726 grades of fertilizers made to serve the needs of American farmers, in addition to unnumbered additional special grades reported as miscellaneous tonnage by various states. Of this total, incidentally, approximately ten percent of the number of grades constituted ninety five percent of the gross tonnage.

As compared with the American practice of making available hundreds and hundreds of special grades and mixes, the fertilizer industry of Europe tends to concentrate on production of but a limited number of grades. T. P. Hignett of T. V. A., reporting to the American Chemical Society last month on European fertilizer technology, observed that by limiting production to just three or four grades, and by running often on a 24-hour schedule, European fertilizer manufacturers can compete in the world market for fertilizers in spite of having substantially higher raw material costs. Their lower wage scale is also a factor, of course, but the most important feature of their operations, in his opinion, is their continuous production of a drastically limited number of fertilizer grades.

It is a great idea, perhaps, to offer the buyer just what he wants in the way of hand-tailored products, special mixes, etc. But, the cost of this mode of operation should be kept in mind at all times, and prices levied in line with the higher costs on such special service. If priced at what they cost to produce, we wonder how many farmers would find that they actually had to have so many of these special grades.

MODERN FERTILIZER TECHNOLOGY DISCUSSED AT

J. H. McNeill

Steam in Batch Mixer Offers Small Fertilizer Operator Means to Make "Granular-type" Fertilizer

THE growing demand for granulated fertilizers may be expected to continue, observed J. H. McNeill of Monsanto Chemical Co., in speaking before the fertilizer division of the American Chemical Society at its annual meeting, held in New York City, September 11-15. Mr. McNeill hastened to point out that the small fertilizer mixer, to meet this demand, is faced with the choice of: (1) installing a complete granulation plant (representing a very sizeable financial investment); (2) going out of the fertilizer business; or (3) with a minimum capital investment, and using existing equipment, making small quantities of a "semi-granular" type fertilizer.

Mr. McNeill described a process developed and demonstrated at one of Monsanto's fertilizer plants in which steam is used in a batch mixer to granulate fertilizer. He emphasized, however, that the process is simply a means by which small operators can "stay in business," supplying their customers with a granular-type fertilizer. The use of steam, he said, has the advantage over commonly used acid processes of eliminating fume problems, and reducing the cost of formulation.

Controlling factors in the system (which is shown in the schematic diagram in Figure 1) are:

1) Injection time of solution and steam
2) Linear feet of drum travel after injection period
3) Proper addition of water.

Moisture and heat balance are controlled by the quality and quantity of the steam added. The steam replaces heat formerly supplied by chemical reaction of sulfuric acid. The steam also contributes the moisture needed for

In the pilot plant, 300 pound batches were granulated in a rotary drum equipped with variable speed drive. Nitrogen solution, acid, and steam were introduced to the tumbling bed of solids. For each grade produced, an optimum combination of time, acid, and steam usage was established to give highest yield of on-size pellets. One of the most important requirements in the process is a skilled operator, – in this case, fertilizer manufacture is again an art.

General requirements for batch steam granulation are: (1) 100 pounds of steam per ton of product; (2) ability to deliver 50 pounds of steam per minute per ton of product; and (3) a method to control the product to 130°F. Where steam is not available, the cost of the installation is increased by the steam requirements. If steam is available, costs would average $3500;

piping	$1500
steam fitting	1000
timer for batch cycle	150
miscellaneous	850
	3500

In commenting on the raw materials for the 4-12-12 grade, Mr. McNeill reported he used rop normal super, coarse potash and suggested that a fine particle size filler be avoided. A coating agent, he said, might be added after manufacture, before bagging. The moisture content of the finished product is 4-6 per cent.

Offering further details on the process, Mr. McNeill listed the following materials and quantities used in the formulation of a semi-granular 4-12-12:

nitrogen solution	164 lbs.
nitrogen solution type (34-60-0)	490
ammonium sulfate	0
normal super, 19%	1262
triple super	0
potash	394
water added	30
steam	60
filler	120

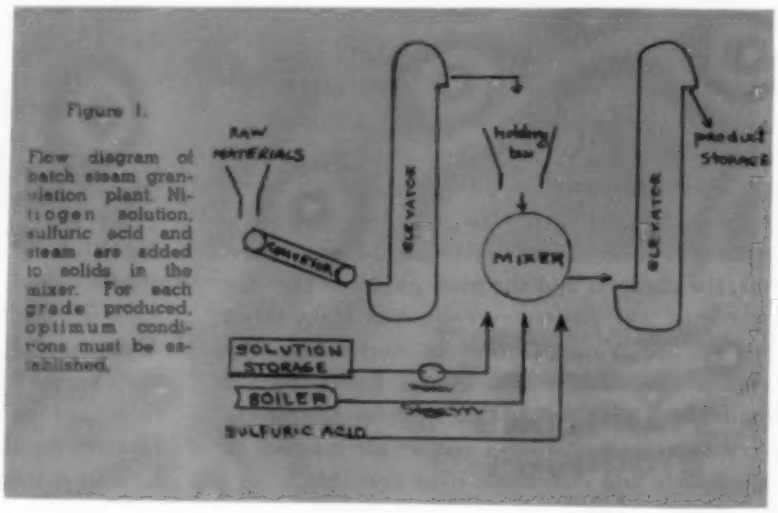


Figure 1.

Flow diagram of batch steam granulation plant. Nitrogen solution, sulfuric acid and steam are added to solids in the mixer. For each grade produced, optimum conditions must be established.

AMERICAN CHEMICAL SOCIETY'S 138th CONVENTION

High Analysis Granular Ammonium Polyphosphate made from Ammonia and Super phosphoric by TVA Process

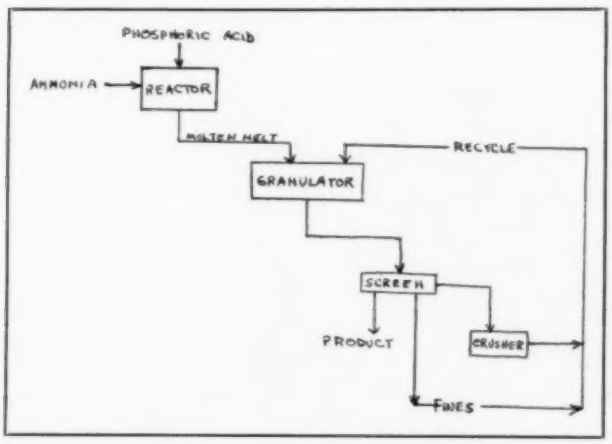
A PROCESS for making granular ammonium polyphosphate—a new, highly concentrated fertilizer, – is being studied at TVA and was reported by J. S. Getsinger. The product, which is made from ammonia and superphosphoric acid (76% P_2O_5) contains about 77% plant food (16% nitrogen, and 61% phosphorus pentoxide). This is a more concentrated fertilizer than any currently being marketed and offers economies in handling, shipping and storage. The report by Mr. Getsinger was prepared by himself, M. R. Siegel, and H. C. Mann, Jr., all of TVA, Wilson Dam, Ala.

Besides standard fertilizer uses such as direct application to soil and blending with other fertilizer materials, this product should be useful, he said, to liquid fertilizer manufacturers in preparing highly concentrated solutions. By dissolving ammonium polyphosphate in water, liquid fertilizer containing as much as 44% plant food (about 10% N and 34% phosphorus pentoxide) can be produced as compared with about 32% plant food (8% N, and 24% phosphorus pentoxide) when using regular furnace phosphoric acid to make liquid fertilizer. A 10% increase in plant food is now possible over the regular electric furnace phosphoric acid method of making liquid fertilizer, Mr. Getsinger indicated.

The liquid fertilizer made with ammonium polyphosphate has the same high concentration as that made directly from superphosphoric acid and ammonia. Also, like superphosphoric acid, it prevents the precipitation of impurities from ammoniated wet-process phosphoric acid. Thus, by adding ammonium polyphosphate, clear liquid fertilizer can be produced from the less expensive wet-process phosphoric acid. The solid ammonium polyphosphate is more convenient and less expensive to ship and store than superphosphoric acid.

Typical operating conditions used in the reaction step to produce grades such as 15-62-0 to 17-60-0 are: pressure, 10 to 300 psi; temperature 340° to 400° F.; and retention time, 20 to 50 minutes. The molten material discharged from the reactor is granulated by mixing with recycle fines. A drying step is not required. The physical properties of the product are excellent. In special tests, finely ground material was ammoniated further to produce grades such as 20-57-0 and 22-56-0. The products appear to be suitable for: (1) direct application, (2) bulk blending with other fertilizers, (3) production of high-analysis liquid fertilizers made from wet-process acid.

Several new fertilizer production processes, a plastic coating for fertilizer, and studies on losses of fertilizer nitrogen from the soil, were among the subjects discussed by the Division of Fertilizer and Soil Chemistry of the American Chemical Society, which held its 138th annual meeting September 11-16 in New York City.



Flow diagram for making granular ammonium polyphosphate. Molten material from the reactor is granulated by mixing with recycle fines. A drying step is not needed.

Plastic Coatings—A Fertilizer Novelty

PLASTIC-coated fertilizer for "lush lawns and gorgeous gardens" was suggested at the final session of the meeting. Coating conventional fertilizers with various plastics slows down the rate at which they release their various constituents to the soil, reported

Dr. Kirk Lawton, a soil chemist from Michigan State University. At the same time, the coating prevents plants from feeding more quickly or heavily than they really need to, he added.

By slowing down the rate of solution of soluble fertilizer in soils, it is possible to reduce leaching losses of nitrogen and potash applied to sandy soils and to minimize excessive absorption of mineral elements by plants. This latter problem is called "luxury consumption," said Dr. Lawton, and is particularly evident in legume crops such as alfalfa and clovers, which absorb potassium in excess of their actual requirements, when confronted with a generous supply of potash fertilizer. In addition, he said, it is believed that salt injury resulting from seed-fertilizer contact may be greatly reduced by coating the fertilizer.

Laboratory and greenhouse experiments carried out by Dr. Lawton showed that plastic coatings, such as vinyl acetate, paraffin, acrylic resin and polyethylene, reduce the rate at which soluble fertilizers dissolve in soils. For example, a coated fertilizer lost only 5.4% of its potassium while the same amount of uncoated fertilizer lost 81.3% in the same period of time, he said.

Optical examination of fertilizer particles showed that coatings resulted in the filling of large pores and cracks, as well as a surface distribution. Intensive greenhouse cropping indicated that excess or luxury consumption of potassium by wheat was reduced by some surface coatings of fused potassium phosphates. Injurious effects of seed-fertilizer contact with wheat was alleviated to some degree by coated fertilizer in greenhouse tests, but a field study with oats showed no specific benefit for coatings. In a field trial of the effect of rainfall and exposure on granule disintegration and release of nutrients from top dressed fertilizer, it was found that coating reduced luxury absorption of potassium by alfalfa. Phosphorus and nitrogen contents were not significantly different, but coatings tended to retard granule disintegration.

As to how much the plastic-coated fertilizer will cost, Dr. Lawton said: "It is likely, at first, that coatings will be applied to specialty fertilizers which may sell at a premium. However, as the economics involved in coating are established, it is possible that this technique may be applied to fertilizers in general."

Observations On European Fertilizer Technology

A short time ago, T. P. Hignett, TVA, visited some twenty fertilizer manufacturing companies in seven European countries, and observed manufacturing technology at the various plants. He reported to ACS on his tour, observing that among the most striking differences in technology in Europe, as compared with the United States, is the fact that most plants (in Europe) operate 24 hours per day, throughout the year, producing 209 to 1500 tons of fertilizer per day. Furthermore, a minimum number of grades are produced in European plants,—sometimes only two grades, others going as high as six grades. By contrast, it is not uncommon for an American fertilizer manufacturer to be making as many as 75 or a hundred different grades of fertilizer.

Raw materials are fairly expensive in European countries, remarked Mr. Hignett. Phosphate rock, for example, must be imported from Morocco or Florida; sulfuric acid is made from imported sulfur; hydrogen for synthetic ammonia is made from expensive sources such as coal or imported oil. In spite of the relatively high raw materials cost, European fertilizer manufacturers compete most aggressively on the world market, exporting about one-half of their production. It would appear, therefore, said Mr. Hignett, that the economies resulting from production on a year-round, 24 hour-basis, with minimum number of grades, are great enough to offset the high raw material cost.

In Europe nitrogen materials are often produced by firms that make and sell mixed fertilizer. The mixed fertilizer plant for each company then provides a steady market for the nitrogen.

There is a strong trend abroad toward direct use of fertilizer materials, said Mr. Hignett. Typical grades in England are 12-12-18, 13-13-13 and 17-11-22. In countries other than England and Scotland, the nitric phosphate process is gaining increasing acceptance.

Eight fertilizer manufacturing processses are in commercial scale use, stated the speaker: Dutch State Mines; Odda; Norse Hydro; Auby; PEC; St. Gobain; Kampka; TVA.

The first three of these processes depend on the separation of calcium nitrate . . . phosphate rock is dissolved in nitric acid, crystallizing calcium nitrate, which is separated by centrifuge, then ammoniated, granulated and potash salts added to form such grades as 20-20-0, 15-15-15, 12-12-20. As much as ⅔ of the calcium may be removed as calcium nitrate, which is

(*Continued on Page* 133)

Program Committee of the ACS Division of Fertilizer and Soil Chemistry: (l to r) secretary, Lawrence B. Hein; vice chairman, John Hardesty; and chairman, T. P. Hignett.

Part II

Agricultural Chemicals: Farmer Attitudes and Use Patterns

by George M. Beal, Joe M. Bohlen and Daryl J. Hobbs

Rural Sociologists
Iowa State University

FARMERS think of using agricultural chemicals mainly in terms of getting rid of a nuisance or for pest control, rather than in terms of specifically "increasing profits."

This sort of attitude offers a challenge for well-conceived, adequately-planned, and properly-implemented education, service, and merchandising programs on the part of those interested in securing optimum farmer use of agricultural chemicals.

This is the conclusion of a two-part report which began on page 38 of the September issue.

Do farmers "approve" of the use of agricultural chemicals?

There appears to be general "approval" of the use of agricultural chemicals. The respondents were given the following statement and asked to complete it in their own words — the sentence completion questioning approach. The statement was, "The farmer who uses agricultural chemicals is _____."

The farmer's completion of the statement was categorized as indicated below.

Unqualified approach ("using his head," "wise," "smart," "using good management," etc)	73 percent
Uncertain ("just in the majority," "smart I guess," "probably ok," etc.)	18 percent
Disapproval ("not smart," "no better than anyone else," "don't know what he's doing," etc.)	4 percent
Don't know answers	5 percent

Why do farmers say they use agricultural chemicals?

Each of the 290 agricultural chemical users in the sample was asked why he used the specific agricultural chemicals presently included in his agricultural chemical program. There was a total of 651 mentions of specific chemicals by the sample members; these farmers gave 875 reason for using the products in question. Space will not allow for detailed discussion of each chemical or even categories of chemicals.

Table 4 presents a summary of the reasons given for using agricultural chemicals—it is a summary of all responses regarding all chemicals in the six categories under discussion.

The profit motive is undoubtedly implicit in many of the reasons given in Table 4. However, it may be significant that only six percent of the reasons given mentioned profit specifically. Another 20 percent of the reasons were to improve crop yields. The "nuisance" aspect was mentioned by far the greatest number, 38 percent.

Additional analysis points up another fact. "Increased farm profits" and "Improve crop yields" were mentioned as reasons for using agricultural chemicals disproportionately in the case of *crop and soil insecticides.* The "nuisance" aspect was mentioned disproportionately in relation to *weed and grass killers.*

What factors limit the use of agricultural chemicals?

To determine the factors limiting the use of agricultural chem-

Table 4. Reasons Why Farmers Use Agricultural Chemicals

Reason	Percent of Total Number of Mentions
1. Best way to get rid of nuisance and/or control pests	38
2. Improve crop yields	20
3. Makes job easier	14
4. Recommended by dealer and/or others	8
5. Saves time—gives more time for other things	7
6. Increases farm profits	6
7. Other	5
8. Don't know	2
	100

icals two related approaches were used.

Each respondent was asked the open end question, "What in your opinion are the most important things which limit your use of agricultural chemicals in your farming operation?" Table 5 presents the results of this question.

Table 5. Factors Limiting the Use of Agricultural Chemicals — Open End Question

Limiting Factor	Percent*
1. Too expensive, cost to much, lack of capital	25
2. Use all I feel I need	23
3. Time required; too busy; busy season	15
4. Lack of necessary application equipment	12
5. Fear of possible crop or soil damage	11
6. Questionable effectiveness; lack of results	6
7. Landlord doesn't believe in it	2
8. Not enough information	2
9. Danger to self; health reasons	1
10. Other	3

Cost was the limiting factor mentioned by the greatest number of farmers. A close second in importance was the belief that they were now using all the agricultural chemicals that they needed.

A second approach to determine the limiting factors in agricultural chemical use was through the use of a more structured approach. The respondents were presented with a list of factors that "might limit their use of agricultural chemicals." They were asked to check those factors that limited their use of agricultural chemicals. After checking those that limited *their* use of chemicals they were asked to rank, in order, the three most important limiting factors. These answers were then weighted; the most important limiting factor was given a score of 3, the second most important 2, and the third most important was given a score of 1. Table 6 presents the weighted score for each limiting factor for both the users and nonusers of agricultural chemicals.

It would seem that the analysis of the results of both the open end and structured questions point toward the conclusion that most of these limiting factors can be overcome with well conceived and properly implemented education, service and merchandising programs.

Satisfaction With Agricultural Chemicals

While there appears to be general satisfaction with the results obtained by those using the various categories of agricultural chemicals, there is difference in satisfaction with several categories of agricultural chemicals. Table 7 presents the satisfaction, or lack of satisfaction, of those who have used the various categories of agricultural chemicals.

Those who have used soil insecticides appear to be most satisfied, while those using weed and grass killers are least satisfied.

Farmer Knowledge of Agricultural Chemicals

If farmers are to use agricultural chemicals in a rational framework, it would seem logical that they would have to possess some knowledge about the various chemicals, their uses and applications. An 11 point agree—disagree knowledge, was designed and administered to all respondents. The farmer scores ranged from none correct to all 11 items correct. The mean score for all respondents was 6.16. By chance alone on an agree—disagree scale it could be expected that a score of 5.5 would be obtained.

(*Continued on Page* 141)

Table 6. Factors Limiting the Use of Agricultural Chemicals — Structured Question with Weighted Scores

Limiting Factor	Total Weighted Score Of Users n=290	Total Weighted Score Of Nonusers n=25
1. Purchase cost	244	31
2. Lack of necessary application equipment	220	27
3. Risk and uncertainty involved in use	151	12
4. Don't feel I need any (more)	144	13
5. Handling and applying	112	0
6. Low return for dollar invested	97	4
7. Time required; busy season	82	3
8. Not enough information about them	80	5
9. Dissatisfied with past experience	60	7
10. Danger to crops and livestock	37	0
11. Heard of another person dissatisfied with chemical use	26	4
12. Landlord	26	3
13. Credit	7	4

Table 7. Satisfaction With Chemical Use

Category Of Chemicals	Percent Satisfied	Percent Not Satisfied	Percent Who Don't Know
Soil insecticides (n=110)	93	4	3
Brush killers (n=80)	91	9	0
Crop insecticides (n=83)	90	10	0
Grain fumigants (n=17)	88	12	0
Weed killers (n=281)	80	19	1
Grass killers (n=14)	72	21	7

*Since the respondents could name more than one limiting factor, the percents do not total 100.

Field Test Results

New Fly Repellents In Dairy Sprays

Results of tests of repellent formulations on livestock indicate that a mixture of 1207 and MGK-264 gave better protection from stable flies and horn flies than did a standard synergized pyrethrum spray.

No significant difference was found between 1207, 3-chloropropyl n-octyl sulfoxide, and 1357, allyl n-octyl sulfoxide. Inclusion of a repellent such as 1207 or R-326 di-n-propyl isocinchomeronate, in a synergized pyrethrum spray formulation improves repellency and protection.

by Roy E. Stansbury and Lyle D. Goodhue

Phillips Petroleum Company
Bartlesville, Oklahoma

A REVIEW of the literature on dairy sprays from 1920 to the present shows they have gone through several changes. Decker (1955) gives an excellent review in his article "Does Fly Control on Livestock Pay?" The public has become aware of the toxicity hazards of pesticides within the past decade and as a result new and safer chemicals are necessary for the control of flies on dairy animals. Consequently, the greater emphasis on repellents has created new problems in testing, and different concepts of fly spray performance. Abrams and Dworkin (1958) point out some of these new concepts. A discussion of standardizing descriptive terms and of methods used to test and report results is given by Dethier, et al. (1960). Dethier (1957) made a comprehensive study of the problems arising in repellent testing in the laboratory.

Considerable use has been made of fly repellents in combination with synergized pyrethrum to provide fly control on dairy cattle since the banning of chlorinated hydrocarbon-type insecticides. In actual practice over the past three years, repellents have proved to be of value and their use is increasing. New and more effective repellents are being developed which promise to give control beyond that obtained previously with the insecticides. Results of tests with the new intense repellent 1207 (3-chloropropyl *n*-octyl sulfoxide) are given in the paper and compared with other repellents in cattle sprays.

Materials and Method

WHILE the objectives are similar, the methods reported in the literature for testing dairy sprays vary considerably. The procedure used in the present investigation is based in part on the best prior suggestions and includes certain modifications. The materials and method are described under the following headings.

Dairy herd. The tests were run on a small herd isolated from other cattle on which control measures might reduce the fly population. In 1958 there were 24 cows available for spraying and 40 in 1959. They were milked about 5:00 a.m. and 5:00 p.m. The herd ranged in a 200 acre pasture between milkings.

Fly population. Since the counts were all made in the pasture the population consisted mostly of the stable fly, *Stomoxys calcitran*, and the horn fly, *Siphona irritans*. An insignificant number of house flies, horse flies and deer flies found on the animals was recorded but not included in the calculations.

The flies were counted each day at 10:00 a.m. and 2:00 p.m. for two weeks prior to the start of the tests to determine the individual attraction for each cow. Cows were selected on the basis of their attractiveness and placed in groups of eight to give nearly equal numbers of flies on each group.

Fly counts. Fly counts were made at 10:00 a.m. and 2:00 p.m. each day in the 200 acre pasture. The number of each species of flies was recorded. Results on stable flies and horn flies only are reported. The number of house flies, deer flies, and horse flies was in-

significant. The counts are subject to the variations incurred in field testing. Trained personnel can count the number of flies on a cow and come up with variations in numbers of less than one per cent. It is recognized that variations can be caused by change in the weather, location of cows, individual habits of cows, etc., and it is necessary to take these into consideration and, if possible, compensate for such variations. By carrying out tests on a number of cows and over an extended period of time, comparable results on various repellents can be obtained.

Application equipment. Two ounces of spray was applied with compressed air sprayers (Hudson Clipper Model 215) fitted with Spraying Systems, Inc., X-1 nozzles. A mist that settled rapidly but that was fine enough to cover the cow was produced. Completely covering a cow including her legs, with two ounces of spray requires experience.

Time of application. Most of the applications were made in the evening. In one series a comparison was made between morning and evening applications. Although the control is lower when applied in the evening, a more severe test and a better evaluation of repellent-type sprays was obtained .

Length of test period. Fly counts were made twice each day six days a week, regardless of the weather. Usually, these six days (12 counts on 8 cows — 96 individual counts) gave enough information to compare the repellent formulations. The pretest fly counts were made the first week in June, and tests were run until the second week in September.

Method of reporting results. Simple fly counts do not express the results of repellent sprays completely, since a repellent often deters feeding without driving the flies away. Although the beneficial effect of a repellent is often greater than the number of flies on the animal would indicate, methods of detecting this were not available so simple fly counts were used. In an effort to tie the fly counts to the population, the number of flies found on the treated animals was compared with the number on the untreated checks according to the following formula:

$$100 - \frac{\text{Avg. no. flies per cow on treated group}}{\text{Avg. no. flies per cow on untreated checks}} (100) = \% \text{ Repellency}$$

Materials tested. The following is a description of the ingredients used to prepare the sprays. Considerable information is given on the new repellents, while the well-known ingredients are merely listed.

1207, 3-Chloropropyl *n*-octyl sulfoxide. This is one of a new class of repellents that are highly repellent to most species of flies. It is a white nearly odorless crystalline solid, m.p. 41-42 C, soluble in oil and insoluble in water. Its toxicity was determined by the Industrial Hygiene Foundation of America. The acute oral LD_{50} for rats is 5660 mg/kg, the acute skin absorption LD_5 for rabbits is 8.0 ml/kg and the 90 day subacute feeding tests on rats at one and two per cent gives no significant pathological changes.

R-1357, Allyl *n*-octyl sulfoxide. This is another new sulfoxide that is highly repellent to many species of flies. It is a white, nearly odorless crystalline compound, m.p. 38-39 C, soluble in oil and insoluble in water. Its toxicity was also determined by the Industrial Hygiene Foundation of America. The acute oral dose for rats is 3730 mg/kg and the acute skin absorption for rabbits is 5.6 ml/kg.

MGK Repellent 326, di-*n*-propyl isocinchomeronate. This is a high boiling liquid ($bp_{0.2}$ 124 C) with a mild odor. It is soluble in oil and insoluble in water. Its

(*Continued on Page* 141)

TABLE I

Fly control on dairy cattle with R-1207 in comparison to some other repellents and synergized pyrethrum for a six day period.

Test No.		Active Ingredients	%	Average Number of Flies Per Cow		Per Cent Fly Repellency		
				Stable	Horn	Stable	Horn	Total Reduction
1	A	R-1207	1.0	3.5	6.9	60	95	93
		MGK-264 (Applied am)	2.0					
	A	(Applied pm)		5.4	33.9	38	74	72
		Control		8.7	131.6			
2	A	R-1207 - MGK-264		0.5	10.3	94	93	93
	B	Pyrethrins	0.025	5.2	84.7	37	39	39
		Piperonyl butoxide	0.25					
		Control		8.2	138.2			
3	A	R-1207 - MGK-264		3.6	20.6	44	91	90
	C	R-1357	1.0	3.8	32.4	41	86	84
		MGK-264	2.0					
		Control		6.4	222.9			
4	A	R-1207 - MGK-264		2.9	29.7	49	85	84
	D	R-326	1.0	3.4	53.7	40	71	71
		MGK-264	2.0					
		Control		5.7	192.9			
5	E	R-1207	0.5	2.5	22.5	52	76	75
		MGK-264	2.0					
	F	Pyrethrins	0.01	1.4	8.9	73	91	90
		R-1207	0.5					
		MGK-264	2.0					
	G	Pyrethrins	0.04	0.6	2.8	89	97	97
		R-1207	0.5					
		MGK-264	2.0					
	H	Pyrethrins	0.05	1.4	2.8	73	97	96
		R-326	0.4					
		MGK-264	0.2					
		Piperonyl butoxide	0.12					
		Control		5.3	89.0			

FERTILIZER USE UP 11.7%

The total amount of fertilizer consumed in the United States for the year ended June 30, 1959 was 25,312,672 tons, an increase of 11.7 per cent over the 21,576,035 tons used in the previous year.

The use of primary plant nutrients increased 14 per cent over '57-'58, attributable at least in part to an overall increase of 17 per cent in planted acreages of corn and cotton.

THE final report on Consumption of Commercial Fertilizers and Primary Plant Nutrients in the United States for the year ended June 30, 1959, just released by the U. S. Department of Agriculture, confirms the findings of the preliminary report issued in January that fertilizer consumption in the 1958-59 year was by far the largest in the history of the country. The gain over the total for the previous year was 11.7 per cent in tonnage of fertilizer consumed and 30.2 per cent in quantity of secondary and trace nutrient materials used by the American farmers. The increase in quantity of primary plant nutrients consumed was 13.9 per cent over the preceding year.

This very substantial increase in use of fertilizers resulted, at least in part, from an increase of 17 per cent in the acreage planted to corn and cotton, which followed a major readjustment in acreage allotments from the previous year. The percentage increase in consumption of fertilizer in 58-59, as compared with 57-58, was highest in those regions in which increases of planted acreages of corn and cotton were highest (the West North Central area) and lowest in those regions where there was little change in planted acreages of these crops (New England).

Total quantity of fertilizer consumed in the year ended June 30, 1959, was 25,312,672 tons, made up of 24,089,468 tons of products containing one or more of the primary plant nutrients and 1,223,314 tons of secondary and trace nutrient materials. This represented an increase over the crop year 57-58 of 2,513,433 tons of fertilizers (11.7%) and 283,476 tons of trace nutrient materials (30.2%).

The fertilizers used by American farmers in the 58-59 crop year contained 7,415,713 tons of primary nutrients, which represented a very substantial increase of 903,326 tons (13.9%) over the previous year. Consumption of nitrogen in the 58-59 year was 2,672,332 tons, up 387,973 tons or 17% from the pre-

Table 1. - Kinds of fertilizers consumed in regions and United States, year ended June 30, 1959[1]

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico	United States
MIXTURES	373,612	1,815,887	3,168,196	1,637,472	1,232,498	2,079,699	988,316	71,324	412,145	779,629	16,069,977
8-8-8	269,058	1,703,258	4,703,958	1,349,334	1,101,197	1,864,882	616,748	38,313	309,162	267,175	14,461,274
8-0	64	640	1,097	64,327	172,461	9,956	35,399	33,185	97,780	1,024	416,130
8-8	99,497	111,038	209,951	218,424	70,889	190,748	37,543	38	2,462	5,895	886,577
8-8	0	111	253,128	205	69	5,048	1,625	21	2,538	25,540	279,301
CHEMICAL NITROGEN MATERIALS	11,738	78,025	880,161	491,407	687,155	581,105	471,405	251,838	351,938	61,870	4,421,804
Ammonia, anhydrous	0	3,023	28,472	97,883	168,340	60,511	145,859	45,315	140,460	728	681,071
Ammonia, aqua	0	0	0	11,497	19,477	4,939	4,734	28,862	168,195	49,112	482,816
Ammonium nitrate[2]	5,307	54,700	196,025	161,835	151,860	290,662	121,581	75,460	54,141	0	1,272,797
Ammonium nitrate-limestone mixtures	50	1,395	263,135	495	35	38,216	2,941	224	315	0	306,151
Ammonium sulfate	600	7,205	8,822	113,517	9,598	13,811	82,134	99,253	207,763	27,994	565,943
Calcium cyanamide	831	6,597	9,373	810	0	7,130	7,980	606	7,317	0	40,838
Calcium nitrate	10	0	11,588	140	0	1,170	586	8,181	30,856	100	52,606
Nitrogen solutions	1,883	6,804	130,987	54,341	156,530	19,739	24,779	11,593	59,580	0	464,440
Sodium nitrate	1,717	11,640	260,438	1,197	994	146,143	99,881	338	213	121	479,374
Urea	1,340	4,960	2,656	17,998	4,907	3,943	23,180	17,604	27,740	5,700	110,176
Other	100	2,413	48,667	13,726	735	113	382	1,438	1,373	7	68,954
NATURAL ORGANIC MATERIALS	25,017	40,938	31,081	51,749	19,286	2,888	6,853	5,915	339,145	153	517,945
Blood, dried	15	115	28	0	0	0	0	49	2,316	0	2,511
Castor pomace	1,579	123	4,181	0	0	0	0	0	2,803	0	7,917
Compost	104	1,007	0	7,660	0,827	0	106	1,604	84	0	19,803
Cottonseed meal[3]	2,371	84	2,168	0	0	27	0	0	96	0	4,738
Fish scrap, meal, emulsions	215	20	0	0	0	0	0	54	1,271	0	1,714
Manures, dried	8,715	16,466	6,264	9,081	1,773	1,267	3,351	1,083	271,146	1	321,951
Sewage sludge, activated	8,050	14,070	8,680	24,258	7,135	1,319	1,697	3,131	17,044	150	84,369
Sewage sludge, other	0	0	139	124	0	6	0	36	53,364	0	53,669
Tankage, all	3,060	0,178	5,449	610	105	23	0	60	1,660	0	10,849
Other	749	210	3,641	0	0	0	11	578	5,406	0	10,245
PHOSPHATE MATERIALS	28,527	84,238	104,365	689,409	411,810	246,384	235,320	155,888	779,116	17,895	2,813,737
Ammonium phosphate: 11-48[3]	0	1,560	35	14,218	55,260	0	4,770	10,605	15,751	1,805	103,518
Ammonium phosphate: 13-39[3]	0	0	0	750	24,451	11	10,538	4,438	6,006	0	92,010
Ammonium phosphate sulfate: 16-20[3]	0	0	0	234	35,371	775	61,665	37,358	38,645	395	135,759
Ammonium phosphate nitrate: 27-14[3]	0	0	0	0	1,081	9	4	1,703	13,457	0	20,134
Basic slag	0	0	20,211	33,777	0	116,751	2,352	0	0	0	173,268
Bonemeal: raw and steamed	1,446	3,819	1,708	1,619	261	411	198	38	2,365	0	11,893
Calcium metaphosphate	0	575	1,700	1,687	22,585	14,784	180	282	31	0	44,814
Diammonium phosphate: 21-53[3]	0	0	0	1,000	5,737	2,582	1,000	9,000	1,000	1,643	20,962
Phosphatic acid	0	0	0	0	181	0	2,269	9,434	11,201	0	23,085
Phosphate rock	350	6,611	19,551	547,455	275,077	12,041	10,443	215	1,599	4,147	819,688
Calcium phosphate	0	0	1,000	4,380	7,175	1,150	0	0	1,250	0	17,967
Superphosphate: 18%	815	7,823	23,459	12,100	16,077	19,175	1,288	101	1,175	0	80,948
" 19%	4,324	0	4,142	453	71	50,001	0	2,775	60,908	5,400	131,865
" 20-20%	21,441	61,739	27,341	41,717	29,736	19,277	68,210	13,411	25,884	0	298,199
" 23-23%	0	0	0	2,610	707	0	449	1,227	69	896	6,146
" 42-44%	0	0	0	110	11,046	0	0	23,869	6,129	0	41,974
" 45%	2	773	30	21,275	30,138	980	9,087	47,190	21,330	0	131,508
" 46%	350	1,180	99	6,249	71,454	1,607	31,055	10,106	237	3,148	186,345
" 47-48%	0	1	4,351	4,950	1,679	778	711	17	0	0	12,501
" 49-50%	0	0	0	0	112	295	71	120	27	0	630
Other	71	0	1,284	752	0	0	54	0	2,983	240	5,370
POTASH MATERIALS	2,621	9,240	90,117	284,660	31,993	66,019	33,081	1,695	13,235	11,884	496,732
Cotton hull ashes	456	24	0	0	8	0	0	0	0	0	488
Low-grade mixtures[2]	0	0	21,271	0	0	7,775	0	0	0	0	29,147
Manure salts	0	0	324	0	0	0	59	0	0	0	443
Potassium chloride: 50%	0	0	54	1,174	0	600	1,947	62	0	0	3,305
" 60%	1,871	6,773	40,086	280,140	30,324	47,417	25,240	1,474	7,831	11,184	451,755
" magnesium sulfate	88	1,210	2,059	2,070	327	1,251	1,347	134	1,751	0	11,759
" nitrate	126	0	101	0	0	0	0	0	0	0	231
" sodium nitrate[3]	0	0	19,077	0	0	672	154	0	0	10	19,913
" sulfate	128	1,259	4,040	1,131	473	6,251	7	1,136	6,428	1,807	25,660
Other	1	73	1,050	134	11	1	307	0	10	0	1,728
SECONDARY AND TRACE NUTRIENT MATERIALS	77	5,980	121,750	1,110	186	3,037	1,954	10,315	1,049,101	2,987	1,201,796
Aluminum sulfate[3]	0	10	7	0	0	0	0	4	16	0	33
Boron[3]	39	201	340	278	94	455	18	0	321	0	1,997
Calcium sulfate (gypsum)	15	5,616	118,347	1,604	396	4,399	999	10,272	1,026,799	0	1,160,667
Copper sulfate[3]	0	0	194	30	0	0	0	139	91	0	454
Iron sulfate[3]	0	0	103	0	83	36	7	484	1,765	2,983	5,261
Magnesium sulfate[3]	24	237	104	46	7	98	2	47	47	50	627
Manganese sulfate[3]	0	114	41	719	6	0	0	48	0	0	1,028
Mixed micronutrients	1	10	1,119	90	88	46	69	1,404	6,885	0	9,460
Sulfur: 25-99.9	0	47	580	90	21	4	1,085	1,955	21,208	0	25,010
Sulfuric acid: 50-95	0	0	0	0	0	0	1,588	2,041	1,211	0	5,851
Zinc sulfate[3]	0	11	865	53	31	116	1	40	3,351	93	4,489
Other	38	1,38	0	410	0	0	35	1,371	7,208	0	10,057
GRAND TOTAL	442,079	2,034,513	4,387,708	3,087,050	2,343,328	2,978,177	1,449,928	961,376	3,030,660	873,608	25,312,672

[1]Includes the following fertilizers distributed by government agencies for test demonstrations. In mixtures, 11-30-0 grade 108 tons, 14-14-14 grade 172 tons, 30-10-0 grade 3,838 tons: in materials, calcium metaphosphate 4,231 tons, superphosphate (54%) 618 tons, diammonium phosphate 3,789 tons, and nitrogen solution (30%) 2 tons. Excludes liming materials or the quantities of materials used for the manufacture of the indicated quantities of commercial mixtures.

vious year; available P_2O_5 was up 2,551,287 tons, a gain of 258,397 tons or 11.3% from 57-58; and the figure for K_2O was 2,192,094 tons, up 256,956 tons or 13.3%.

Variation in Use By Area

The increase in fertilizer consumption was widely distributed across the country, however there were a number of areas in which the increase exceeded the national average. These included the West North Central, East South Central and South Atlantic regions, where incidentally acreage of corn and cotton is highest. There were seven states in which consumption of fertilizer was lower in 58-59. These included Vermont, Rhode Island, New York, Arizona, Utah, Nevada and Washington. The highest percentage increase was reported for Kansas (47%).

Consumption of Mixtures

Mixtures comprised 63.5% of the total tonnage of fertilizers consumed in 1958-59, amounting to 16,069,027 tons, which was an increase of 1,716,004 tons (12%) from the previous year. This was the first year since 1952-53 that an increase in use of mixtures has been reported. There were 1,726 different grades of fertilizers reported in use. Consumption of mixtures was substantially heavier this year in most of the Central and South Atlantic States. Consumption decreased in Arizona, Florida, Hawaii, Montana, New York, Rhode Island and Vermont.

N-P-K mixtures represented 90.1% of the total tonnage of mixtures, while the other types (N-P, P-K, N-K) accounted for 2.6%, 5.5% and 1.8% respectively. There were 118 different grades which were used in amounts upwards of 10,000 tons. The volume represented by these 118 grades was 14,470,486 tons, which amounted to 91.64% of the total quantity of mixtures used. Grades consumed in amounts between 2,500 and 10,000 tons numbered 113.

The fifteen grades consumed in largest tonnage are shown in the accompanying table. As in the preceding year, the 5-10-10, 4-12-12 and 5-20-20 grades were preferred, in this order. The other twelve most used grades were the same as in the 57-58 crop year, but their relative tonnages differed substantially from the record of the previous year. At least eleven of the grades in each area were among the fifteen consumed in largest tonnage the previous year, although not always in the same order of use. In most cases, shifts this year in preference for the various grades resulted from increased use of grades of higher nitrogen content.

In the mixtures, the national average content of N was 6.22% in 58-59, which represented an increase of 4.36% from the previous year. For available P_2O_5 the average was 12.54%, up only 0.08% from the previous year. For K_2O the national average use in mixtures was 11.91, up 1.53% from the earlier year. Total average primary nutrient content of all fertilizer mixtures was 30.67%, the highest ever recorded. These figures reflect the continuing trend toward increased concentration of primary plant nutrients in mixtures used throughout the United States. The high rate for consumption of nitrogen resulted from substantial increases in average nitrogen contents in 45 areas, and decreases in only five.

Direct Application Materials

Total consumption in 1958-59 of materials for direct application, including secondary and trace nutrient materials, amounted to 9,213,645 tons, or 36.% of all fertilizers used. This represented an increase of 1,080,905 tons, or 13.2%, over the 8,162,740 tons used during the previous year. Although the total tonnage of all classes of direct application materials in-

Table 2 - Primary plant nutrients consumed in regions and United States as mixtures and as direct-application materials, by kinds, year ended June 30, 1959

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico	United States
Nitrogen											
MIXTURES: 5-10-10	28,414	107,097	222,581	234,080	109,608	101,042	51,707	4,305	31,397	10,122	900,322
4-12-12	5	42	130	5,189	12,961	2,436	4,780	6,071	13,781	79	45,276
5-20-20	0	13	29,307	23	3	581	259	1	318	1,434	31,939
MATERIALS:											
Ammonia, anhydrous	0	2,486	11,375	31,150	138,195	49,606	113,744	27,384	113,219	844	493,179
" aqua	0	1/	0	2,687	2,836	1,290	1,393	5,939	72,711	10,312	96,968
Ammonium nitrate	1,796	12,755	52,515	94,438	111,131	88,023	41,178	25,881	31,798	0	459,419
Ammonium nitrate-limestone mixtures	12	244	54,715	50	6	7,865	525	61	65	5,881	69,425
Ammonium sulfate	82	1,481	7,775	43,705	2,000	2,500	17,269	12,471	47,653	0	135,437
Cyanamid, raw and cleaned	50	137	62	50	0	127	10	0	68	0	337
Calcium cyanamide	139	1,473	1,871	167	0	1,510	1,639	127	1,573	0	8,617
Calcium nitrate	2	1/	1,788	0	0	103	69	1,207	4,751	16	8,071
Natural organics	1,667	7,801	1,815	2,177	655	181	261	281	1,643	0	15,681
Nitrogen solutions	467	2,109	39,415	30,432	37,650	4,775	8,017	1,666	12,539	0	136,824
Phosphate products	0	203	141	2,551	27,180	611	16,136	13,971	22,084	567	83,444
Potassium products	10	1/	2,080	1/	1/	1/	0	0	1/	0	2,091
Sodium nitrate	271	1,079	42,864	139	51	23,646	3,251	49	24	20	71,493
Urea	780	3,251	11,804	8,189	2,270	1,648	10,324	8,821	12,672	2,606	62,165
Other chemical nitrogen products	121	2	141	273	170	13	38	238	309	0	1,305
Total nitrogen	33,356	142,912	479,741	485,895	450,191	286,723	280,550	119,716	370,700	32,024	2,670,748
Available P_2O_5											
MIXTURES: 5-10-10	38,578	138,114	455,504	517,864	222,408	188,170	95,431	6,216	35,148	15,201	1,796,634
4-12-12	7	115	130	20,158	47,588	1,451	6,278	7,003	15,165	210	99,991
5-20-20	4,960	21,886	29,155	40,121	17,867	19,059	7,660	11	97	984	140,110
MATERIALS:											
Ammonium phosphate: 11-48	0	939	17	6,306	31,350	0	2,270	5,095	7,351	679	53,879
13-39	0	0	0	148	9,438	4	5,932	1,402	2,367	0	19,441
Ammonium phosphate sulfate: 16-20	0	0	0	93	19,610	36	17,270	11,823	20,791	81	69,824
Ammonium phosphate nitrate: 27-14	0	0	0	0	470	0	0	350	1,180	0	2,000
Basic slag	0	0	1,651	2	0	10,451	198	0	0	0	12,304
Bonemeal: raw and steamed	170	1,200	447	428	81	120	30	0	374	0	2,850
Calcium metaphosphate	0	134	1,705	2,436	13,956	5,000	2,570	127	1,000	781	26,709
Diammonium phosphate: 21-53	5	113	344	2,237	3,037	1,104	594	5,285	1,014	781	14,570
Natural organics	615	1,051	588	2,151	851	73	142	191	5,446	0	11,617
Phosphate rock and colloidal phosphate	0	268	548	13,836	7,110	478	980	41	96	124	24,230
Phosphoric acid	0	0	0	0	46	0	1,262	5,031	5,961	0	12,300
Potassium products	15	1/	0	0	1/	0	0	0	0	0	15
Superphosphate: 20% and under	5,570	6,739	10,917	11,298	1/ 135	17,260	12,600	1,219	16,930	1,479	109,277
over 20%	178	697	2,751	42,288	64,251	6,837	13,511	10,304	12,471	1,793	155,751
Other phosphate products	22	0	105	163	0	0	0	0	280	0	570
Total available P_2O_5	50,015	239,488	503,638	661,140	442,007	259,115	173,730	84,617	135,384	20,888	2,551,027
K_2O											
MIXTURES: 5-10-10	38,500	177,413	474,415	438,181	174,538	137,600	45,351	2,994	27,098	15,017	1,603,371
4-12-12	6,160	11,744	40,871	55,124	14,511	11,587	4,138	11	485	1,215	181,846
5-20-20	0	14	34,113	24	3	864	259	1	187	1,441	41,906
MATERIALS:											
Lime-potash mixtures	0	1	1,081	1/	0	470	0	0	0	0	1,554
Manure salts	0	0	85	0	0	0	15	0	0	0	100
Potassic organics	105	441	71	550	108	10	70	54	1/	1	1,410
Potassium chloride	1,437	3,855	24,602	123,705	31,797	18,729	28,258	977	1,280	6,772	266,840
" magnesium sulfate	22	275	1/	491	201	279	295	11	338	0	2,372
" nitrate	57	0	47	1	0	0	0	0	1	0	106
" sodium nitrate	0	0	2,733	0	0	97	43	1/	1/	0	2,874
" sulfate	64	841	2,330	1,540	215	1,107	1	595	1,100	962	11,006
Other potassium products	100	0	169	17	4	1/	60	0	2	0	347
Total K_2O	46,445	194,584	581,946	677,641	226,361	260,851	78,439	4,646	44,491	41,481	2,130,954
GRAND TOTAL: N, avail. P_2O_5, K_2O	129,816	577,984	1,565,325	1,824,676	1,118,559	807,691	532,719	208,979	550,575	117,393	7,413,717

1/ Less than 0.5 ton.

Table 3—Mixtures Consumed in the United States by grade, year ended June 30, 1959.

(excludes Hawaii and Puerto Rico)

	5-10-10	4-12-12	5-20-20	12-12-12	10-10-10	3-12-12	6-12-12	3-9-9	5-10-5	4-16-16	5-10-15	4-10-7	2-12-12	0-20-20	6-8-8			
New England	41,730	0	0	6,143	64,313	5	2,120	0	5,821	0	4	0	0	12,493	3,478	103	237,510	373,619
Mid. Atlantic	710,161	20,288	2,134	22,380	186,853	25,943	37,730	664	182,577	645	21,477	0	22,479	72,584	87	241	909,715	1,805,887
So. Atlantic	719,892	961,228	0	1,861	93,132	73,382	23,052	464,608	93,769	1,082	178,952	31,710	276,945	5,595	36,064	1,007	2,197,384	5,160,196
E. So. Cent.	114,545	1,545	699,826	309,188	222,817	449,439	33,230	218	11,982	427,209	10,408	0	1	111,178	0	273	1,040,879	3,432,495
W. So. Cent.	1,911	44	240,775	293,144	68,388	29,702	12,641	0	6,373	15,457	2	0	0	38,445	0	335	845,706	1,552,608
E. So. Cent.	41,390	296,896	25,601	17,673	70,379	32,482	368,321	531	74,479	4,170	133,831	274,128	1,074	29,439	201,163	284	544,047	2,078,604
W. So. Cent.	9,971	134	14,525	47,097	5,413	15,294	5,770	0	74,036	0	420	0	0	11,143	11,234	182	496,619	691,316
Mountain	2	0	0	379	2,400	0	21	0	418	0	0	0	0	34	0	185	70,270	73,524
Pacific	1,196	0	196	571	32,951	0	17	0	235	0	0	0	0	368	0	196	371,108	412,144
Total	1,640,700	1,280,135	983,847	900,038	747,746	626,227	482,902	466,021	449,700	448,563	345,094	305,838	300,501	281,857	252,026	1,996	6,313,198	15,790,393

the increase was greatest in chemical nitrogen materials and in secondary and trace nutrient materials, followed by phosphates, potash and natural organics in the order named. More than one-half of the increased consumption of direct application materials was represented by increased use of nitrogen. Consumption of nitrogen was up 616,427 tons, or 15.9%, from the previous year. Increases for the other classes of materials were 283,476 tons (30.2%) for secondary and trace nutrients, 109,912 tons (4.6%) for phosphates, 46,394 tons (10.3%) for potash and 24,696 tons (5.0%) for the natural organics.

Consumption of nearly all chemical nitrogen materials for direct application increased substantially in 1958-59. The decrease for ammonium sulfate may have been due to supply and distribution problems inasmuch as consumption for direct application increased in most producing areas. However, the much larger tonnage of mixtures consumed (in the formulation of which ammonium sulfate finds principal use) may have resulted, it is believed, in shortages for direct application in areas distant from production centers. The use of calcium cyanamide decreased in many areas.

Consumption of the natural organic products increased about five per cent from the preceding year. Dried manures accounted for most of the increase in this class.

Among the phosphate products, the principal changes involved increased use of ammoniated phosphates and superphosphates, and decreased use of phosphate rock. The principal changes occurred in States in which these products were used in largest quantity. The increase in the tonnage of the ammoniated phosphate grades (11-48, 13-39, 16-20, 27-14) accounted for more than one-half of the increase in the phosphate class. The 21-53 grade, however,

(Continued on Page 133)

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Chemicals in Food Production

NACA Discussions Emphasize: Essential Role of Chemicals in U. S. Food Supply—Safe Use of Pesticides—Public Relations

IN a strong statement before NAC members, Congressman Jamie L. Whitten, (D. Miss.) observes that the "entire nation's food supply is being threatened through lack of knowledge as to just how much we are all dependent upon chemicals for our supply of the most economical, plentiful, nutritious food any nation has ever had."

— A special report on the September 27-29 annual meeting of the National Agricultural Chemicals Association at del Coronado Hotel, Coronado, California

The following comments are excerpts from Mr. Whitten's address:

Chemicals and the Food Supply

Congressman Jamie L. Whitten
(D. Miss.)

It takes so few of us to produce food, clothing and shelter for the rest of us, that the rest of us provide the highest standard of living for all of us.

Views on Farm Policy

- What we have been doing hasn't worked.
- Farm income should come from the market place. Agriculture should get its return, as do Industry and Labor, from the consumer as a part of the retail price. Any future farm program must provide that farm income shall come from the production of that quantity of product necessary for foreign and domestic markets.
- There is one area where costs could be saved. We should make it possible to save the total cost of producing surplus units by not producing them. Commodities from CCC stocks should be offered to farmers in consideration for cutting back farm production.
- It is more sound to provide a means to obtain a fair price for two bushels of corn than to assure a reduced price for three bushels, one of which we do not need.
- Once production and demand are in reasonable adjustment, it would appear that fair and reasonable price supports should be provided for the farmer's share of the domestic market. Any over-production should be eligible for foreign markets at world prices.

On Use of Agricultural Chemicals

- The development of more effective pesticides is one of the reasons why only 12% of the people in this country are able to feed the other 88%.
- It is hard for anyone not closely associated with agriculture to realize how utterly dependent we all are on chemicals. If it were not for the use of chemicals, fertilizers and pesticides, in five years the cost of a very inferior quality of food to the American consumer would double.
- Without insecticides we would have to plant twice as much acreage, half for the insects, and half for ourselves.
- Production of commercial quantities of many of our common vegetables would cease without pesticides. . . . Late blight could wipe out our potato crop whenever conditions were favorable to the disease . . . Florida's $10 million sweet corn crop depends on control of the corn earworm with insecticides. . . . Lima bean growers were almost put out of business in the Eastern states until an economical chemical control was found for downy mildew. . . . Commercial production of apples would be impossible in this country without the use of insecticides and fungicides . . . Without pesticides, peaches and cherries would rapidly disappear from our markets. . . . When the Mediterranean fruit fly struck at the Florida citrus industry in 1956, we could easily have lost this major supply of citrus if we had not eradicated this pest with insecticides. . . . Chinch bugs would cause an average loss of over a million dollars a year in corn and sorghums, except for the use of insecticides. . . . Witchweed would take over great sections of our nation except for herbicides. . . . Ranchers would once more be forced to market thousands of cattle at unfavorable times if we abandoned the use of insecticides to protect our winter ranges from grasshoppers. . . . If we stopped using chemicals to protect cattle, hogs, sheep, and poultry from only six major external parasites, we would add well over $100 million to the annual cost of production. . . . If it were not for pesticides the screwworm would destroy the South-

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Edens & Winnetka, Northfield, Illinois

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Firm Name .....

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City ..... Zone ..... State .....

east as a source of beef. . . . Except for pesticides cotton yields would only have been about 50% throughout the boll weevil belt where the average losses from '49 to '54 were more than $350 million. . . . A moratorium on chemicals in marketing channels would cost billions of dollars in losses due to insects that attack stored products.

- Some say we should rely on nature and natural enemies of destructive diseases and pests. Nothing would cut our standard of living in half quicker than such a course.

- It is becoming popular to advocate a showing of zero tolerance on anything used in producing, handling, or protecting foods. Protection of the public health is vital. However, to insist upon any such thing as zero tolerance, would rule out the air we breathe and even the water we drink. Actually to follow any such policy would greatly endanger all of us, as a result of the contaminated, scarce and poor quality food which would be available under such a policy.

- We must not permit the overzealous or politically ambitious, in efforts to curry favor with the 88% of our people who are non-farmers, to destroy or dry up the safest, the most nutritious, the cheapest and the widest variety of the most plentiful supply of the best food that the people of any nation ever enjoyed through history.

- In protecting the public health of today we must not permit anyone to endanger the public health of the future by prejudicing public opinion against the very means which makes our ample supplies of wholesome and nutritious food available.

Restore Public Faith in Agricultural Chemicals

THE public must be reassured of the importance and safety of agricultural chemicals, lest current concern about their use stifle research vital to the nation's agricultural progress, NAC members were told by Association president, Jackson V. Vernon. "The factual evidence is overwhelmingly on our side," he stated, "We should welcome any opportunity to tell our story. When and where we've had the chance and done so, we have never regretted it."

To help implement its program, Mr. Vernon recommended that the industry support an informal federation of chemical trade organizations to cooperate in such fields of common interest as food additive legislation. He also urged the development of a sound program on procedures for the operation of scientific advisory committees, since an increasing number of problems are being referred to such specially created groups, and their actions are becoming correspondingly more important.

Forecast of agricultural chemical sales of a billion dollars (at the manufacturer's level) by 1975 was made by Mr. Vernon, who is a vice-president of Food Machinery and Chemical Corporation. Present annual industry sales are judged at over 280 million dollars at the basic manufacturer's level.

Despite significant improvements in control methods, Mr. Vernon reported, pests destroy an estimated 13 to 15 billion dollars worth of crops each year. Combined with a rapidly growing population and shrinking farm manpower, he said, they present problems that will eventually create a serious national food shortage unless food production can be increased at better than past rates.

"The projected shortage of the nation's food supply must be made up by even greater technological and scientific progress," he declared. "Developments in the agricultural chemicals industry will most certainly be vital in this effort. The vigor with which we tackle this challenge will determine in no small degree the state of America's food supply fifty years from now."

Pesticides and World Health

In discussing the role of insecticides in protecting the health of populations in the United States and abroad, Dr. Henry van Zile Hyde, U. S. Department of Health, Education and Welfare, reviewed both the direct effects through the control of vector-borne diseases and the indirect effect connected with increased agricultural and industrial production. "Except for the antibiotics," he said "there are probably no materials that protect the world's people against more diseases than do the chlorinated hydrocarbon insecticides. Considerable progress has been made in the world-wide malaria eradication program, now under way in some 95 countries or other political units, under the leadership of the World Health Organization with the assistance of the United Nations Children's Fund and two agencies of the U. S. Government – the International Cooperation Administration, and the Public Health Service. Today, 297,458,000 people live in areas recently malarious but where the disease has now been eradicated. Another 700,000,000 are being actively protected by malaria eradication programs, largely by insecticides.

"Development of resistance to insecticides by insect vectors is an important problem of disease control programs, but research is uncovering new materials and techniques to meet this challenge. Before being accepted, all new insecticides must be screened for toxicity to humans and their potential health hazards determined.

"Insecticides, already an important tool in the control of disease, undoubtedly will benefit from the accelerated research now under way and will be more widespread in the future."

Pesticides Essential To Farmer

"THE American farmer could no more eliminate pesticide chemicals than he could get along without tractors, certified seed, etc," observed Dr. Alfred M. Boyce, University of California, in a report titled "Pesticide Safety Makes Sense." Pesticide chemicals have contributed about half of the 35 to 50 per cent increase in farm productiveness that gives us our abundant, safe and high-quality food and fiber," he continued.

"It has been amply demonstrated that modern pesticide chemicals can be used safely and effectively. However, it is also recognized that misuse of pesticides by a few growers can result in serious consequences not alone in the marketing of the affected crop, but more importantly it can contribute to lessening the confidence of the public in the safety of our food supplies. This misuse by growers, whether through ignorance or intent, occurs so infrequently that it does not constitute a real threat to the health of consumers. In actuality, agricultural producers essentially have their destiny in their own hands in regard to the use of permitted chemicals, since misuse can lead to unnecessary, restrictive and costly regulation and produce many incidental, perhaps insurmountable problems.

"A substantial number of scientific appraisals of the factual situation concerning residues on food has appeared in the literature . . . explaining the limits of the problem and pointing out the need for scientific interpretation of the Delaney cancer clause in the Food Additives Amendment. It is a fact, however, that most of the excellent factual information that is being written on this subject is being published in media that only come to the attention of scientists or those directly concerned with agricultural production, processing and marketing. Essentially, we have been talking to ourselves. Since newspapers of this country are the largest and most effective mass information media, it is our responsibility to do everything possible to get the press to accept the scientifically proved facts regarding the safety of the nation's foods, and this information should be written in context that can be readily understood by the general public.

"It is easier, of course, to make sensational news copy from scare-type information than it is to attract reader interest in factual aspects of the vital role pesticide chemicals play in production of an abundance of safe foods." The facts are there, however, Dr. Boyce concluded, — and it is up to industry to protect its own interests by getting this message across to the public.

Left: Newly elected president of NACA, George P. Ferguson. At right, the retiring president, Jackson V. Vernon.

September 28, Coronado, Calif. . . . George R. Ferguson, president of Geigy Agricultural Chemicals Division, Geigy Chemical Corp., New York was elected president of NACA at its 27th annual meeting in Coronado, Calif. He succeeds Jackson V. Vernon, vice president of Food Machinery & Chemical Corp., who has served the Association as president for the past three years. Dr. Ferguson has been a member of NAC's Board of Directors since 1958, and served as vice president last year.

Herbert F. Tomasek, president of Chemagro Corp., Kansas City, Mo., was elected vice president of NAC. He has been a member of NAC's Board of Directors since 1959.

Three new members were elected to the Board of Directors: Tom K. Smith, Jr., vice president, Monsanto Chemical Co., and general manager, Agricultural Chemicals Division, St. Louis; W. F. Price, Swift and Co., Chicago; and M. C. Van Horn, Florida Agricultural Supply Co., Div. of Wilson Toomer Fertilizer Co., Jacksonville, Fla.

Issues Of Carcinogenicity

ONE of the major problems,— and questions in the identification of compounds and chemicals as carcinogens is the testing procedure for carcinogenicity, remarked Dr. Hardin B. Jones, of the Donner Laboratory of Medical Physics, University of California. Scientists studying carcinogens or compounds suspected of being carcinogens are often in disagreement in: what should be called a carcinogen, — the procedure for testing for carcinogenicity, — or interpretation of the same data.

Thus, remarked the speaker, the first matter will be the establishment of an acceptable procedure of testing, evaluating and interpreting data. "We can often

select part of the data, and make it fit a 'case' about which we are speculating," observed Dr. Jones, in a candid approach to the serious problem of carcinogens and pesticides on food, "but what we must strive for is an honest and precise evaluation of the hazards involved, and their degree."

In referring to the cranberry-aminotriazole episode, Dr. Jones indicated that he questioned some of the interpretations placed on the test data collected. In planning a test program to give a valid determination of possible carcinogenicity, he suggested, it is important to set up a procedure in which test animals are exposed to the material being tested, and then removed from exposure for a recovery period to allow for disappearance of what may perhaps be merely temporary symptoms, rather than to continue an uninterrupted exposure.

One important question to be determined, he noted, is whether or not there is a threshhold in carcinogenicity hazard, below which no danger is offered. Tests to date have not yet been conclusive on this point, but they are continuing.

Finally, Dr. Jones suggested, where any question of hazard is involved, whether of carcinogenicity, radiation hazard or other like threat to human health, if the hazard is determined to be sufficiently minor in nature, the choice as to what action to take then becomes simply a common sense determination of whether the good to be accomplished by use of the product outweighs the relatively small hazard involved.

Public Relations In 60's

"THE subject of public relations for agriculture is one that's getting a lot of attention these days," commented Wally Erickson of Station KFRE in Fresno, California, as one of the panel members discussing "Public Relations in the Sixties," before NAC members. "At times," he continued," we seem to be getting ourselves deeper into the hole, the more we talk about it."

"It's a popular saying among folks in agriculture that they have the worst public relations and get the worst press of any segment of the economy. And I don't happen to think this is so at all. Farmers just think it's so . . . because they have a special kind of problem, that needs special attention."

Mr. Erickson pointed out that farmers have more going for them "public relations wise" than just about anyone else . . . the USDA, industry, NACA, farm press, and members of the National Association of Television and Radio Farm Directors. The challenge, said Mr. Erickson, is how to put out the word. We've got the tools, he remarked, but I'm not sure we've had the direction. Up to this point, probably too much of the total effort has been spent in talking to each other, within the field of agriculture. What we need to do is project out, – get the message to the other 90 per cent of the people what a wonderful job the farmer is doing to provide the world's best supply of food, – and how he is starting it out to the consumer at a ridiculously low price when you consider everything that's gone into the production of that product . . . So this is the challenge . . . how to put out the word.

Mr. Erickson outlined the role of farm radio and television programs in "meeting this challenge," along with the job done by industry, NAC and other organizations. "We are in a position," said Mr. Erickson, to give 'city folks' a true picture of agriculture, refute the distorted statements, and publicly relate the necessity for a strong and vigorous agriculture for the good of a prosperous America and a prosperous world."

Donald Lerch, of Washington, D. C. urged industry to "strengthen its ties with friends of the industry, – get them to understand the objectives better, and motivate them to speak up for the use of pesticides." Industry has a wealth of talent in communications and persuasion, – all that's needed for success is first of all the decision to go ahead, the decision to move on to positions of leadership of public opinion.

How does a corporation fit into the public relations picture? was the question reviewed by George K. Johnson, Monsanto Chemical Company, and answered in two parts: Each company should be sure it has interpreters (professionals) working on getting correct and true information to the public; and second, backing its own program with money . . . since it takes money to reach the public.

"We have an educational problem," he reminded, getting our story across to the confused public, which bases its opinion on value judgments. How well we succeed in doing this will determine the eventual success of our program.★★

In planning a test program to give valid determination of possible carcinogenicity, it is important to set up a procedure in which test animals are exposed to the pesticide material being tested, and then removed from exposure for a recovery period to allow for disappearance of what may perhaps be merely temporary symptoms, rather than to continue an uninterrupted exposure.

WACA CONFERENCE RE-ELECTS WELDON PRESIDENT

Industry urges modification of laws governing pesticides on food

IF too many barriers are set in the way of launching new pesticides before the public, industry will be less inclined to make the investment necessary for development of new agricultural chemicals, observed Dr. J. T. Thurston, American Cyanamid Co., New York, in addressing members of the Western Agricultural Chemicals Association, at the annual fall meeting of the organization held September 24-26 at the Riviera Hotel, Palm Springs, Calif. The overall effect of too much legislation, continued Dr. Thurston, will be fewer new products in the pesticide field, increased costs, and a longer life for established products.

"Federal laws," he said, "must not hinder the technological advancements in food production and processing, but should rather bring encouragement in an atmosphere of understanding, free of prejudice, suspicion and harassment." Political considerations must not hinder industry, Dr. Thurston emphasized, if we are to continue our scientific advancements in food production for the expected future increase in population.

The speaker reviewed the fundamentals of federal laws dealing with registration of pesticide chemicals. "I feel there is confusion as to just where FDA and USDA come into the picture." To clarify the picture he reviewed the interrelationship between the Miller Pesticides Amendment to the Food, Drug and Cosmetic Act and the Federal Insecticide, Fungicide and Rodenticide Act.

Under FDA, the first law was enacted in 1906, followed in 1938 by the Food, Drug and Cosmetic Act . . . the Miller Pesticide Amendment was passed in 1954 . . . and the Food Additives Amendment in 1958. The Miller Law, empowers the Secretary to establish tolerances for pesticide residues on raw agricultural commodities, while the Additives Amendments empowers the Secretary to establish residue tolerance in or on processed foods. Under the Act of 1938, it was the responsibility of FDA to prove the safety or lack of safety of an additive; — the new law places the burden of proof on the manufacturer.

Under USDA, the first specific Federal Insecticide Law was passed in 1910, covering only insecticides and fungicides, — rodenticides and herbicides were added to the group of products covered by a law passed in 1947, and amended in 1959 to include desiccants, plant regulators, and nematocides. The law refers to all of these chemicals as economic poisons or pesticides. FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) regulates the labeling and marketing of pesticides, and is designed to protect the user from physical injury or economic loss. It is also intended to protect the public from injury, exposure to, or contact with pesticides in the transportation or storage of raw agricultural products, and while they are held for sale.

Dr. Thruston reviewed the general procedures for registering a pesticide with FDA, — pointing out the many opportunities for delay that may arise in getting a product registered. Briefly, — it is necessary that a product be submitted to the USDA filing a petition with FDA for registration under the Miller Law. The USDA may request additional data if they feel the original data is not adequate. In addition, they may decline to grant registration on the basis of poor data or if the application is not in compliance with the Miller Amendment. Among information required by USDA are effect of the pesticide on crop yields and flavor, and phytotoxicity details.

USDA requires replicated tests to determine the effectivenes of the product, and the tests must be conducted in at least three different areas on the same crop and against

Left:
Officers for 1960-61: (l. to r.) Frank Stewart, Miller Products, vice-president; G. H. Weldon, Velsicol Chemical Corp., re-elected president; and George T. Poppic, Coastox, Inc., vice-president.

Right:
Speakers at the Palm Springs meeting: Joseph E. Burger, H. V. Nootbaar & Co.; Virgil H. Freed, Oregon State College; and J. T. Thurston, American Cyanamid Co.

the same pest. Differences in climatic conditions will of course affect the performance of the product. Full reports of investigations with respect to safety (acute and chronic toxicity) are also required. "It is not possible to design a single test program that will apply to every pesticide in all of its applications," observed Dr. Thurston, – thus costs for just this phase of acquiring data may run some $80-100,000.

To develop an analytical method and to compile residue data to clear a pesticide under the Miller Amendment costs from $10,000 to $150,000, depending on the complexity of the chemical. In addition, to compile necessary residue data on treated commodities cost can run $400,000 to $500,000. Thus it is obvious why in crops of limited acreage management turns down research dollars to develop information to clear such crops under the Miller Amendment.

"You will agree," said Dr. Thurston, "that we in industry are well regulated and the consumer well protected. We do not need further legislation, nor do we need the adverse publicity given in the past few months on chemicals in food which has cast doubt on the position of the chemical industries relative to the protection of public health. We are convinced that the technological advances over the past 15 years to human welfare in the use of chemicals in food production, storage, processing, and packaging have been fully demonstrated."

"The chemical industry supported present federal laws before and after their enactment," stated Dr. Thurston, "However, after government agencies and industry operated and gained experience working under them, it is apparent to industry that certain modifications are necessary. We are hopeful that modifications can be made, within reason, in order that scientific advancements may continue."

Research on Pesticides

If we are to continue to enjoy high quality foods, – and the high production yields of agricultural crops, observed Virgil Freed, Oregon State College, we must continue to use chemicals, – and support research for the development of better chemicals. Research is a vital activity in our economy, continued Dr. Freed, – and industry should make some provision for more fundamental research and biological testing.

"Basic research can be directed . . . have an objective," remarked the speaker, and not be of "the head in the cloud" type, which commercial men are inclined to steer away from. Areas of research which would expedite development of new products at a lower cost include: a more vigorous approach to corelating structure and biological activity; more study on the development of systemics – especially in the field of fungicides; a systematic approach to biological testing; – further study on what makes chemicals translocate in the plant.

Dr. Freed appealed to industry to take careful stock of its pricing practices . . . to be sure to make that margin of profit which will allow them to pay for the services and research necessary to further develop their respective companies. Through unhealthy competition,– sale on the basis of price rather than service, – a very good product like 2,4-D has "practically been ruined," observed Dr. Freed. He continued to say that in recent years more 2,4-D could have been sold, if formulators could have afforded to handle the product.

Also commenting on pricing practices was Joseph E. Burger, H. V. Nootbaar & Co., who observed that "the competitor who is in competition only to compete is not a threat to any manufacturer, – the business that goes on developing and improving its products, paying no attention to competition, is the real challenge." Mr. Burger's address dealt primarily with the need for all Americans to take a greater interest in activities of the Federal government, – to curtail increasing expenditures and the mounting Federal debt, – the continued appropriation of state rights in a liberal interpretation of "general welfare." When any government runs a business, remarked the speaker, it normally does so in a highly expensive and inefficient way.

WACA Business Session

WACA members relected as president of the Association George H. Weldon, Velsicol Chemical Corp. Vice presidents for 1961 are: George T. Poppic, Coastox, Inc.; and Frank Stewart, Miller Products. New directors elected by the membership include: Robert McKenzie, Union Carbide Chemicals Co.; C. E. Cody, California Spray Chemical Corp.; Coleman Edgar, Hercules Powder Co.; L. Isenhour, Rohm & Haas Co.; and Converse H. York, Shell Chemical Corp.★★

Areas of research which would expedite development of new pesticides at a lower cost include: a more vigorous approach to corelating structure and biological activity; more study on the development of systemics — especially in the field of fungicides; a systematic approach to biological testing; and further study on what makes chemicals translocate in the plant.

'60 '61 BUYERS' GUIDE

for the agricultural chemicals trade

- MANUFACTURERS
- MIXERS
- FORMULATORS

of

- FERTILIZERS
- INSECTICIDES
- FUNGICIDES
- HERBICIDES

PLUS

A Separate Listing of Equipment and Supplies for the AGRICULTURAL APPLICATOR

ON PAGES 79-81

THIS Buyers' Guide differs in several respects from other such compilations that have been prepared for use in the agricultural chemicals industry. To begin with, it has been designed primarily for use by "the trade,"—by manufacturers, mixers and formulators of pesticides and fertilizers, rather than by dealers and end users. It contains no lengthy lists of suppliers of finished products, but is confined primarily to basic sources of raw materials used in making these end products. Thus when we list suppliers of such pesticides as DDT, BHC, endrin, chlordane, etc., we have confined our listings to suppliers of the technical materials, rather than trying to cover all the firms that sell finished products made therefrom. The same applies to fertilizers, fungicides, herbicides, etc.

Second, we have put our main emphasis on listing basic producers rather than resellers. The test has been "does the source manufacture, mine or otherwise produce the item in its own facilities, does it act as an exclusve sales agent for such a producer, or does it import directly from a foreign producer?" Rather than compiling a long list of local sources of supply, we have tried to confine our listings to basic producers in position to supply substantial tonnages at producers' prices. As a result our guide is much more compact and readily useable than others that have been published. We list dealers only in a dealers' listing.

Within these limits we have tried to make the guide as complete as possible by listing every basic source of supply with which we are familiar. No names have been purposely omitted. If you are a basic supplier of any of the materials listed, or of other articles which you believe should be included in this guide, just let us know and we will be happy to make the necessary changes before publishing our 1961 edition. It is our wish to make this guide as complete and accurate as possible, within the limits outlined. If there are errors or omissions, we will welcome the assistance of users of the guide in correcting them.

Now, a note about using the guide. We have made every effort to eliminate the duplications of listings common to so many guides, confining our listings to the minimum practical rather than repeating the names of the same group of suppliers half a dozen times under essentially the same basic headings. Thus, there is a listing for diluents, but none for carriers,—one for baits, but none for attractants. We list suppliers of anhydrous ammonia, urea, nitrogen solutions, ammonium sulphate, etc. under the one basic heading of Nitrogen Raw Materials, indicating for each company so listed what specific items are supplied. A fairly complete list of cross references refers the buyer directly to the basic product listing. We hope the compact make-up and format of the guide will make it a volume which can be kept handy for repeated reference through the year.

ATLANTA UTILITY
- Ammoniator-granulators
- Batch Mixers
- Elevator Boot Breakers
- Cage Mills
- Vibrating Screens
- Broadfield Superphosphate Units

ATLANTA UTILITY WORKS
East Point, Georgia
See advertisement on Page 113

UNION
Multiwall Bags
recommendations based on 5-star packaging efficiency plant
UNION BAG-CAMP PAPER CORP.
233 Broadway, New York 7, N.Y.
See advertisement on Page 95

Bemis
MULTIWALL BAGS
featuring
the Duette valve
BEMIS BRO. BAG CO.
408 Pine St., St. Louis
See advertisement on Page 115

KRAFTPACKER
Kraft's newest open mouth bag filling machine
also
Kraft Multiwall Bags
KRAFT BAG CORPORATION
630 Fifth Ave., New York 20
See advertisement on Page 13

EXPANDA-KRAFT BAGS
Multiwall bags made of Expanda-Kraft: reduce breakage, stack securely, withstand moisture, print sharp, fill fast.
Hollingsworth & Whitney Div. of
SCOTT PAPER COMPANY
Chester, Pennsylvania
See advertisement on Page 108

ADJUVANTS, SPRAY—See Sprayers-Stickers, Wetting Agents, Solvents, Emulsifiers

AGITATORS—See Mixers

ALDRIN—See Insecticides

ALLETHRIN—See Insecticides

AMMONIATOR-GRANULATORS

Atlanta Utility Works
East Point, Ga.

Blue Valley Equip. Mfg. Eng'g. Co.
Topeka, Kans.

Chemical Engineering Service Div.
Manitowoc Shipbuilding Inc.
Manitowoc, Wis.

Davidson Kennedy Co.
Box 97, Station D, Atlanta, Ga.

Dorr-Oliver Inc.
Stamford, Conn.

Fertilizer Engineering & Equip. Co.
Sturgeon Bay Road, Green Bay, Wisc.
(pan granulators)

Link Belt Co.
Prudential Plaza, Chicago 1

McDermott Bros.
Washington & 3rd, Allentown, Pa.

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24

A. J. Sackett & Sons
1337 S. Highland Ave., Baltimore

Stedman Foundry & Machine Co.
Aurora, Ind.

Sturtevant Mill Co.
123 Clayton St., Boston 22

Worthington Corp.
Harrison, New Jersey

AMMONIUM SULFATE — See Nitrogen Materials (Solid)

ANIMAL FEED SUPPLEMENTS

E. I. du Pont de Nemours & Co.
Wilmington, Del.

Eastman Chemical Products, Inc.
Kingsport, Tenn.

Hooker Chemical Corp.
Phosphorus Div.
Jeffersonville, Ind.

Intl. Minerals & Chemical Corp.
Skokie, Ill.

U. S. Industrial Chemicals Co.
99 Park Ave., New York 16

ANTIBIOTICS—See Fungicides

ANTI-CAKING AGENTS—See Conditioners (Fertilizer)

APPLICATION EQUIPMENT and SUPPLIES—See Pgs. 79-81

ARSENATES—See Insecticides

ATTRACTANTS—See Baits

BHC—See Insecticides

BAGS (Cloth)

Bemis Bro. Bag Co.
408 Pine St., St. Louis, 2

Chase Bag Co.
255 Lexington Ave., New York 17

Mente Bag Co.
2811 Touro, New Orleans

Percy Kent Bag Co.
715 Armour Rd., N. Kansas City, Mo.

Premium Bag Co.
5353 Boston St., Baltimore 24

Werthan Bag Corp.
1400 8th Ave., N, Nashville, Tenn.

BAGS (Multiwall)

Albermarle Paper Mfg. Co.
P. O. Box 2189, Richmond 17

Ames Harris Neville Co.
2600 84th St., Berkeley 10, Calif.

Arkell Safety Bag Co.
6345 W. 65th St., Chicago 38

Bagpak, Div., Int'l. Paper Co.
220 E. 42nd St., N. Y.

HY POLY KRAFT
Multiwall Bags
save you money
BAGPAK DIVISION
International Paper
220 E. 42nd St., New York
See advertisement on Page 28

WONDERWALL
Multiwall Bags
made of
Kraftsman Clupak Paper
West Virginia Pulp & Paper Company
230 Park Ave., New York 17
See advertisement on Page 121

BAGS (Multiwall) (Contd.)

Bemis Bro. Bag Co.
601 S. 4th St., St. Louis

Chase Bag Co.
355 Lexington Ave., New York 17

Crown Zellerbach Corp.
231 Sansome St., San Francisco

Continental Can Co.
100 E. 42nd St., N. Y. 17

Equitable Paper Bag Co.
45-50 Van Dam St., Long Island, N. Y.

Hudson Pulp & Paper Co.
477 Madison Ave., N. Y.

Hollingsworth & Whitney
Div. of Scott Paper Co.,
Chester, Pa.

Kraft Bag Corp.
630 5th Ave., N. Y. 20

Olin Mathieson Packaging Div.
W. Monroe, La.

Owens Illinois Glass Co.
Toledo 1, O.

Percy Kent Bag Co.
5910 Vinner Blvd., Kansas City, Mo.

Raymond Bag Corp.
Middletown, Ohio

St. Regis Paper Co.
50 E. 42nd St., N. Y. 17

Union Bag-Camp Paper Corp.
233 Broadway, N. Y.

West Virginia Pulp & Paper Co.
230 Park Ave., N. Y. 17

BAGS (Paper, lined and unlined)

Bagpak Div., Int'l Paper Co.
220 E. 42nd St., N. Y. 17

Bemis Bro. Bag Co.
408 Pine St., St. Louis, 2

Chase Bag Co.
355 Lexington Ave., New York 17

Chippewa Plastics
Chippewa Falls, Wis.

Continental Can Co.
Flexible Packaging Div.,
Devon, Pa.

Crown Zellerbach Corp.
231 Sansome St., San Francisco

Kraft Bag Corp.
630 Fifth Ave., New York 20

Raymond Bag Corp.
Middletown, Ohio

St. Regis Paper Co.
50 E. 42nd St., New York 17

Union Bag-Camp Paper Corp.
233 Bway, New York

Universal Paper Bag Co.
New Hope, Pa.

West Virginia Pulp & Paper Corp.
230 Park Ave., N. Y. 17

BAGGING — Thread

Bemis Bro. Bag Co.
408 Pine St., St. Louis, 2
(Acid resistant thread)

Chase Bag Co.
355 Lexington Ave., New York 17

E. I. du Pont de Nemours & Co.
Textile Fiber Dept.
Wilmington, Del.

BAG PACKING, WEIGHING AND CLOSING MACHINERY

Bagpak Div., Int'l Paper Co.
220 E. 42nd St., New York 16

Black Products Co.
13513 S. Calumet Ave., Chicago 27

Bemis Bro. Bag Co.
408 Pine St., St. Louis 2

BIF Industries
536 Harris Ave., Providence 1, R. I.

Burrows Equipment Co.
1316-AC Sherman Ave., Evanston, Ill.

Coddington Mfg. Co.
5024 N. 37 St., Milwaukee 9, Wisc.

Exact Weight Scale Co.
Columbus, O.

Dave Fischbein Co.
38 Glenwood Ave., Minneapolis

George H. Fry Co.
42 E. 2nd St., Mineola, N. Y.

Inglett & Co., Inc.
P. O. Box 3425, Augusta, Ga.

Kraft Bag Corp.
630 Fifth Ave., N. Y. 20

Lowndes Engineering Corp.,
Valdosta, Ga.

Raymond Bag Corp.
Middletown, O.

Richardson Scale Co.
Clifton, N. J.

Stoker Co., H. L.
111 S. College Ave., Claremont, Calif.

St. Regis Paper Co.
150 E. 42nd St., N. Y. 17

Thayer Scale Corp.
Pembroke, Mass.

Union Bag-Camp Paper Corp.
233 Broadway, N. Y. 17

Union Special Machine Co.
412 N. Franklin St., Chicago 10

BAITS and ATTRACTANTS (To be combined with pesticides in the formulation of finished insecticide baits)

Givaudan-Delawanna, Inc.
321 W. 44th St., New York 36
(Methyl Eugenol)

Nutritional Biochemicals Co.
21010 Miles Ave., Cleveland
(Yeast Hydrolysate)

BAGS

- multiwalls • textile
- plastic and laminated bags
- consumer-size paper bags
- other packaging materials

CHASE BAG COMPANY
355 Lexington Ave., New York 17
See advertisement on 2nd cover

CLUPAK

extensible paper

CLUPAK Multiwall Sacks

and Paper Bags from

your supplier

See advertisement on Page 33

POLYETHYLENE COATINGS on BAGS

ideal for packaging feed • seed • pesticides • ammonium nitrate other fertilizers

UNION CARBIDE PLASTIC COMPANY
Div. Union Carbide Corp.
270 Park Ave., New York 17
See advertisement on Page 112

PACKAGING MACHINERY

I & C Acto-Cutter

Union I & C Bagger

UNION BAG-CAMP PAPER CORP.
233 Broadway, New York 7, N.Y.
See advertisement on Page 18, 19

Bag Closing Machinery

For automatic, square or flat paper bags

GEORGE H. FRY COMPANY
42 East 2nd St., Mineola, N. Y.
See advertisement on Page 127

BAITS and ATTRACTANTS (Contd.)

A. E. Staley Mfg. Co.
Decatur, Ill.
("P.I.B." Protein Insecticide Baits)

Marvin R. Thompson
52 Davenport St., Stamford, Conn.

BARREL LINERS

Arkell Safety Bag Co.
6345 W. 65 St., Chicago 38, Ill.

Bemis Bro. Bag Co.
408 Pine St., St. Louis 2

Chase Bag Co.
355 Lexington Ave., New York 17

Kalamazoo Vegetable Parchment Co.
Parchment, Mich.

Donald Palmer, Inc.
2627 Tchoupitoulas St., New Orleans

BHC — See Insecticides

BIN INDICATING DEVICE

Bin-Dicator Co.
13946 Kercheval, Detroit 15, Mich.

Convair
Pittsburgh 26, Pa.

BIN VIBRATOR

Cleveland Vibrator Co.
2828 Clinton St., Cleveland, Ohio

B. W. Elliott Mfg. Co.
Binghamton, N. Y.

Gerotor May Corp.
Owings Mills, Md.

Syntron Co.
579 Lexington Ave., Homer City, Pa.

BLENDERS — See Mixers

BOILERS — See Refractory Products

BONE MEAL

Amer. Agricultural Chemical Co.
100 Church St., New York 7

Baugh Chemical Co.
25 S. Calvert St., Baltimore, Md.

Consolidated Chemical Industries
6910 Fannin St., Houston, Texas

Darling & Co.
4101 S. Ashland Ave., Chicago 9

Faesy & Besthoff, Inc.
25 E. 26th St., New York 10

Van Iderstine Co.
37030 Riview Ave., L. I. C., N. Y.

BORATES

Amer. Potash & Chem. Corp.
3000 W. 6th St., Los Angeles 54

U. S. Borax
Pacific Coast Borax Co. Div.
630 Shatto Pl., Los Angeles 5

BUCKETS

Blaw Knox Co.
300 6th Ave., Pittsburgh 22

Inglett & Co.
Augusta, Ga.

C. S. Johnson Co.
Champaign, Ill.

CALCIUM ARSENATE — See Insecticides

CARTONERS and CARTON PACKERS

Burt Machine Co.
401 E. Oliver Street, Baltimore 2, Md.

Chisholm-Ryder Co. of Pennsylvania
Bleitner Avenue, Hanover, Pa.

Clybourn Machine Corp.
6479 N. Avondale, Chicago 31, Ill.

J. L. Ferguson Co.
Route 52, Joliet 3, Ill.

R. A. Jones & Co.
P. O. Box 485, Cincinnati, O.

National Equipment Corp.
153-7 Crosby Street, New York, N. Y.

Pneumatic Scale Corp.
65 Newport Ave., North Quincy 71, Mass.

Standard-Knapp Div., Emhart Mfg. Co
Portland, Conn.

Stokes & Smith Co.
5915 Summerdale Ave., Philadelphia, Pa.

Triangle Package Machinery Co.
6633 West Diversey Blvd., Chicago, Ill.

CATTLE DIPS AND SPRAYS

California Spray-Chemical Corp.
Richmond, Calif.

Chemical Service of Baltimore
Howard & West St., Baltimore

Chipman Chemical Co.
Bound Brook, N. J.

Eagle Soap Co.
Huntington, Ind.

Haag Laboratories, Inc.
140th & Seeley, Blue Island, Ill.

Higley Chem. Co.
Dubuque, Iowa

R. M. Hollingshead Corp.
Camden, N. J.

Hysan Prods. Co.
936 W. 38th Place, Chicago

Peck's Prod. Co.
610 E. Clarence Ave., St. Louis

Rex Research Corp.
Toledo, Ohio

Standard Oil Co. (Ohio)
Midland Bldg., Cleveland

Thompson-Hayward Chem. Co.
2915 Southwest Blv., Kansas City, Mo.

James Varley & Sons
1200 Switzer Ave., St. Louis

DIATOMITE

for free-flowing,
non-caking
fertilizers

KENITE CORPORATION
Overhill Bldg., Scarsdale, N. Y.

See advertisement on Page 22

CATTLE GRUB CONTROL PREPARATIONS

Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.

Dow Chemical Co.
Midland, Mich.
(Trolene)

CHELATING AGENTS

Dow Chemical Co.
Midland, Mich.
(Versenes)

Faesy & Besthoff, Inc.
25 East 26th St., New York 10
(F&B Nutritional)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Sequestrenes)

Hampshire Chemical Corp.
Poisson Ave., Nashua, N. H.

Refined Products Corp.
624 Schuyler, Lyndhurst, N. J.
(Perma Green)

CHLORDANE — See Insecticides

CLOTHING, PROTECTIVE (gloves aprons, guards, etc.) see also Masks

Acme Protection Equipment Co.
1201 Kalamazoo St., S. Haven, Mich.

American Optical Co.
Mechanics St., Southbridge, Mass.

Charleston Rubber Co.
21 Stark Ind. Park, Charleston, S. C.
(Gloves)

Disposables, Inc.
11 Mercer St., New York 13
(Disposable Paper Work Clothes)

Hub States Chemicals & Equipt.
1255 Windsor St., Indianapolis 1, Ind.

Jomac-North, Inc.
Warsaw, Ind.

Mine Safety Appliances Co.
201 N. Braddock Ave., Pittsburgh 8

Singer Glove Mfg. Co.
860 W. Weed St., Chicago 22
(Disposable Paper Clothing)

CONDITIONERS (Fertilizer)

Aquafil Co.
321 State St., Los Altos, Calif.

Armour Industrial Chem. Co.
110 N. Wacker Dr., Chicago 6, Ill.

Dicalite Dept. Great Lakes Carbon Corp.
612 S. Flower St., Los Angeles 17
(Dicalite)

Eagle Picher Co.
Central Pkway & Walnut St., Cinn.
(Celatom)

Intl. Commodities Corp.
11 Mercer St., New York 13

Johns Manville Corp.
22 E. 40th St., N. Y. 16
(Celite)

Kenite Corp.
Overhill Bldg., Scarsdale, N. Y.
(Kenite 51, Kenite AC)

Minco Products Co.
Box 367, Saginaw, Mich.

Minerals & Chemicals Corp. of America
27 Essex Turnpike, Menlo Park, N. J.
(Attacote)

Moores Lime Co.
Springfield, Ohio
(Doloxide)

National Aniline Div.,
Allied Chem. Corp.
40 Rector St., New York

Petrochemicals Co.
Long Beach, Calif.
(Petro AG)

Quaker Oats Co., Chemicals Div.
Merchandise Mart, Chicago 54, Ill.
(Fur-Ag)

Star Enterprises, Inc.
212 York St., Cassopolis, Mich.
(Creek-o-Nite)

Stepan Chemical Co.
Edens & Winnetka, Northfield, Ill.

Thomas Alabama Kaolin Co.
2412 Ken Oak Rd., Baltimore 9, Md.
(Tako)

Ultra Chemical Works
Div. of Witco Chemical Co.
Paterson 4, N. J.
(Sulframin)

U. S. Graphite Co.
Saginaw 17, Mich.

Zonolite Co.
135 LaSalle St., Chicago 3
(Terralite)

CONSULTANTS AND RESEARCH AGENCIES

Agricultural Aviation Eng'g. Co.
858 Scott St., Santa Clara, Calif.
(Aerial)

A. Edison Badertscher
1113 N. Rolling Rd., Baltimore 28
(labeling, compounding)

Battelle Memorial Institute
505 King Ave., Cambridge 42, Mass.

TERRA-LITE®
fertilizer conditioner
granular carrier
Terra-Lite Div.
ZONOLITE COMPANY
135 S. La Salle St., Chicago 3, Ill.
See advertisement on Page 20

Bio-Search & Development Co.
2019 W. 71st Terrace, Kansas City
(Research and Development)

Alvin J. Cox, Ph.D.
118 Emerson Street, Palo Atlo, Calif.

Doane Agricultural Service
5142 Delman Blvd., St. Louis
(marketing studies)

Edwards Laboratory
Norwalk, Ohio
(Soil Testing Service)

Evans Research and Development Corp.
250 E. 43rd St., New York 17
(Product Development. Evaluation)

Florida Field Trials
Dr. G. R. Townsend, Belle Glade, Fla.
(Field Trials, Chemical Evaluation)

Food & Drug Research Laboratories Inc.
Maurice at 58th St., Maspeth 58, N. Y.
(Toxicological and Inhalation Studies)

Harris Laboratories, Inc.
816 "P" St., Lincoln 8, Neb.
(Field Trials, Toxicology, Research)

Hazleton Laboratories
Falls Church, Va.
(Inhalation Studies, Toxicity Tests)

Hill Top Research Institute, Inc.
Miamiville, O.
(Toxicity, Irritation Tests)

Leberco Laboratories
123 Hawthorne St., Roselle Park, N. J.
(Toxicity, Irritation Studies)

Dr. Emery D. Robert
3121 N. Sheridan Rd., Chicago, 14
(Market Surveys, Technical Research and Development)

Rosner-Hixon Laboratories
7737 S. Chicago Ave., Chicago, 19
(Toxicity, Irritation Studies)

Vincent Sauchelli
303 Overhill Road, Baltimore, Md.
(Fertilizers — Pesticides, Market Research, Plant Production)

Scientific Associates
3755 Forest Park Ave., St. Louis 8, Mo.
(Animal Studies, Toxicity and Bacteriological Testing)

Foster D. Snell, Inc.
29 West 15th St., New York 11
(Research Testing and Development)

Sperling Laboratories
8815 N. 24th Street, Arlington, Va.
(Research, Testing, Toxicity)

Theodore Riedeburg Associates
415 Lexington Ave., New York, 17
(Testing, Marketing)

United States Testing Co.
1415 Park Ave., Hoboken, N. J.
(Research, Testing, Toxicology)

Wisconsin Alumni Research Foundation
P. O. Box 2217-DD, Madison 1, Wis.
(Formulation, Labeling, Testing)

Wolf's Agricultural Laboratories
2620 Taylor St., Hollywood, Fla.
(Testing, Chemicals Evaluation)

CONTAINERS (for consumer packages of pesticides, fertilizers, etc.) — See also Pails

Bradley Container Corp.
Thompson St., Maynard, Mass.

Cleveland Container Co.
6201 Barberton Ave., Cleveland 2

Harcord Mfg. Co.
125 Monitor St., Jersey City, N. J.

R. C. Can Co.
9430 Page Blvd., St. Louis 14

Stone Container Corp.
4200 W. 42nd Place, Chicago 32

CONTRACTORS — See Fertilizer Plants

CONVEYORS

Atlanta Utility Works
East Point, Ga.

Barber Green Co., (belt conveyor)
Aurora, Ill.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Carrier Conveyor Corp.
206-A No. Jackson St., Louisville, Ky.

Farquhar Div., (belt conveyor)
York, Pa.

Fertilizer Engineering & Equip. Co., Inc.
Sturgeon Bay Road, Green Bay, Wisc.

Fuller Co. (pneumatic conveyors)
Catasauqua, Pa.

Inglett & Co.
P. O. Box 3425, Augusta, Ga.

Jeffrey Mfg. Co.
E. First Ave. & 4th St., Columbus 16,

Joy Manufacturing Co. (belt conveyor)
401 Oliver Bldg., Pittsburgh

Kennedy-Van Saun Manufacturing & Engineering Corp.
405 Park Ave., New York 22
(pneumatic conveyor)

C. S. Johnson Co.
Champaign, Ill.

Link Belt Co.
Prudential Plaza, Chicago 1

Power-Curv Conveyor Co.
2185 S. Jason St., Denver 23

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24

K. E. Savage Co. (bag conveyor)
823 W. 21 St., Norfolk 10, Va.

Triangle Brand
COPPER SULFATE
Fungicide
Wood Preservative
Trace Element
Phelps Dodge Refining Corp.
300 Park Ave., New York 22
See advertisement on Page 8

CONVEYORS (Contd.)

Sturtevant Mill Co.
123 Clayton St., Boston 22

Schaffer Poidometer Co.
2828 Smallman St., Pittsburgh 22

COOLERS — See Dryers

COPPER SULFATE — See also Fungicides

Faesy & Besthoff, Inc.
25 E. 26 St., New York 10, N. Y.

Intl. Commodities Corp.
11 Mercer St., New York 13

Phelps Dodge Refining Corp.
300 Park Ave., New York 22

Republic Chemical Corp.
94 Beekman St., New York 38

Tennessee Corp.
617 Grant Bldg., Atlanta

CRUSHERS — See Mills

CRYOLITE

Aluminum Co. of America
Pittsburgh, Pa.

Harshaw Chemical Co.
1945 E. 97th St., Cleveland 6

Pennsalt Chemicals Corp.
Tacoma, Wash.

United Heckathorn
600 S. 4th St., Richmond 4, Calif.

Custom Packaging
in units of one pound or more
also
NUTRA-MIN
containing: manganese, iron
copper, zinc, boron, molybdenum
DAVIES NITRATE CO., INC.
118 Liberty St., New York 6
See advertisement on Page 129

CUBE — See Insecticides

CUSTOM GRINDING

Fluid Energy Processing & Equipment Co.
Richmond & Norris Sts., Phila. 25

Lebanon Chemicals
Lebanon, Pa.

CUSTOM PACKAGING (finished products for resale under private brand)

Davies Nitrate Co.
118 Liberty St., New York 6
(Fertilizers)

Faesy & Besthoff
26 E. 26th St., New York 10

Plant Food Corp.
3711 Medford St., Los Angeles, 63

Private Brands, Inc.
300 S. 3rd St., Kansas City 18, Kans.

DDT — See Insecticides

DDVP — See Insecticides

DEALERS and DISTRIBUTORS (Chemicals)

American-British Chem. Supplies
180 Madison Ave., N. Y.

Amsco Solvents & Chemicals Co.
4619 Reading Road, Cincinnati 29, O.

H. J. Baker & Bro.
271 Madison Ave., N. Y.

Barada & Page
Kansas City, Mo.

Berkshire Chemicals, Inc.
420 Lexington Ave., N. Y. 17

Bradley & Baker
155 E. 44th St., New York

John H. Calo Co.
19 Rector St., N. Y. 6

T. G. Cooper & Co.
Cedar & Venango Sts., Phila. 34

Dickerson Co.
Drexel Bldg., Phila.

Eastern Industries
Ridgefield, N. J.

Faesy & Besthoff
26 E. 26th St., N. Y. 10

FORMULATORS
PACKERS
DISTRIBUTORS
of
Insecticides • Fungicides
Fertilizers
FAESY & BESTHOFF, INC.
26 East 26th St., New York 10
See advertisement on Page 131

Alex C. Fergusson Co.
Drexel Bldg., Phila.

Fort Pitt Chemical Co.
3134 Penn Ave., Pittsburgh

Gaylord Chem. Co.
701 Woodsweather Rd., Kansas City

Globe Chemical Co.
Murray Road, Cincinnati

Griffin Chem. Co.
1000 16th St., San Francisco

Hummel Chemical Co.
90 West St., N. Y.

Innis Speiden & Co.
420 Lexington Ave., N. Y.

Los Angeles Chem. Co.
2200 Santa Fe Ave., Los Angeles

John F. Maher & Co.
1600 Henderson St., Houston, Tex.

Merchants Chemical Co.
60 E. 42nd St., N. Y.

Millmaster Chem. Corp.
295 Madison Ave., N. Y.

Missouri Solvents & Chemicals Co.
419 De Soto Ave., St. Louis 7, Mo.

Ohio Solvents & Chemicals Co.
3470 W. 140th St., Cleveland 11, Ohio

Philipp Bros.
N. Y. Coliseum, New York

Prior Chem. Corp.
420 Lexington Ave., N. Y. 17

G. S. Robins & Co.
126 Chouteau Ave., St. Louis

Robeco Chemicals, Inc.
25 E. 26th St., N. Y.

Southern Solv. & Chem. Corp.
Jefferson Highway, New Orleans

Texas Solvents & Chemicals Co.
8501 Market St., Houston

Thompson-Hayward Co.
2915 Southwestern Blvd., Kansas City

Toledo Sols. & Chems. Co.
4051 South Ave., Toledo, O.

Chas. A. Wagner Co.
4455 N. 6th St., Phila.

Wisconsin Solvents & Chemicals Corp.
1719 S. 83rd St., Milwaukee

Woodward & Dickerson, Inc.
1400 S. Penn Square, Philadelphia 2

FERTILIZER and FEED MATERIALS
POTASH
NITROGEN
WOODWARD & DICKERSON
1400 S. Penn Square, Phila. 2, Pa.
See advertisement on Page 20

DEFOLIANTS — See Herbicides

DERRIS — See Insecticides

DETERGENTS FOR FRUIT WASHING

National Aniline Div.,
Allied Chem. Corp.
40 Rector St., New York

Antara Chemicals
435 Hudson St., New York

Cowles Chemical Co.
7016 Euclid Ave., Cleveland

Colgate Palmolive Co.
300 Park Ave., New York, 22

Diamond Alkali Co.
Union Commerce Bldg., Cleveland

Diversey Corp.
1820 W. Roscoe St., Chicago

DuBois Co.
Cincinnati, Ohio

Essential Chemicals Co.
5906 N. Port Washington Rd., Milw.

National Milling & Chemical Co.
4601 Flat Rock Rd., Philadelphia

Nopco Chemical Co.
60 Park Pl., Newark 1, N. Y.

Oronite Chemical Co.
200 Bush St., San Francisco 20

Procter & Gamble Distributing Co.
Cincinnati, Ohio

Solvay Process Div.
61 Broadway, New York

John T. Stanley Co.
642 W. 30th St., New York

Stepan Chemical Co.
Edens & Winnetka, Northfield, Ill.

Swift & Co.
Chicago

Ultra Chemical Works
2 Wood St., Paterson, N. J.

Virginia-Carolina Chemical Corp.
501 East Main St., Richmond, Va.

Westvaco Mineral Prods. Div.
161 E. 42nd St., New York 17

Witco Chemical Co.
122 E. 42nd St., New York 17

Wyandotte Chemicals Corp.
Wyandotte, Mich.

DIAZINON — See Insecticides

DIELDRIN — See Insecticides

DIETHYL TOLUAMIDE — See Repellents

DILUENTS, CARRIERS & EXTENDERS

Aquafil Co.
Box 94, Los Altos, Calif.

American Colloid Co.
Merchandise Mart Plaza, Chicago 54

American Talc Co. (Clatyl)
Chatsworth, Ga.

American Vermiculite Corp.
527 Madison Ave., New York 22

Bell Clay Co.
Gleason, Tenn.

Godfrey L. Cabot, Inc.
125 High St., Boston 10, Mass.

Calcium Carbonate Co.
520 S. 4th St., Quincy, Ill.
(CCC Diluent)

California Industrial Minerals Co.
Friant, Calif.
(Frianite)

Carbola Chemical Co.
Natural Bridge, N. Y.

Cohutta Talc Co. (Talc)
Dalton, Ga.

Commercial Minerals Co.
310 Irwin St., San Francisco
(calcium carbonate)

Dicalite Dept. Great Lakes Carbon Corp.
612 S. Flower St., Los Angeles
(Dicalite)

Eagle-Picher Co. (Celatom)
900 American Bldg., Cincinnati, 1

Eastern Magnesia Talc Co. (Emtco)
206 Bank St., Burlington, Vt.

Floridin Co. (Diluex, Florex)
Tallahassee, Fla.

General Reduction Co. (Pikes Peak)
1820 Roscoe St., Chicago, 13

Glendon Div., Carolina Pyrophyllite Co.
Greensboro, N. C.

Georgia Kaolin Co.
511 Westminster Ave., Elizabeth, N. J.

BARDEN CLAY
carrier — diluent
J. M. HUBER CORP.
630 Third Avenue
New York 17, New York
See advertisement on Page 119

• Attacote
Fertilizer Conditioner
• Attaclay
Pesticide Carrier
• Attagel
Suspending Agent
MINERALS & CHEMICALS PHILIPP CORP.
743 Essex Turnpike
Menlo Park, New Jersey
See advertisement on Pages 10, 11

PYRAX ABB
pesticide dust diluent
R. T. VANDERBILT COMPANY
230 Park Avenue
New York 17, New York
See advertisement on Page 128

TAKO
colloidal kaolinitic kaolin
carrier — diluent
The Thomas Alabama Kaolin Co.
2412 Ken Oak Road
Baltimore 9, Maryland
See advertisement on Page 143

CELITE
diatomite fillers
JOHNS-MANVILLE
Box 14
New York 16, N. Y.
See advertisement on Page 130

insecticide grade
PYROPHYLLITE
diluent and extender
GLENDON DIVISION
Carolina Pyrophyllite Company
P. O. Box 2414, Greensboro, N.C.
See advertisement on Page 133

TYPE—41
kaolin clay
SOUTHEASTERN CLAY COMPANY
Aiken, S. C.
See advertisement on Page 109

DILUENTS, CARRIERS & EXTENDERS (Contd.)

Georgia Talc Co.
Chatsworth, Ga.

Huber, J. M., Corp., (Barden, Suprex)
630 Third Ave., New York, 17

Industrial Minerals & Chemical Co.
6th & Gilman Sts., Berkeley, Calif.
(Soapstone, B56)

Intl. Commodities Corp.
11 Mercer St., New York 13

International Clay Corp.
Graniteville, S. C.

Johns-Manville Products Corp.
22 East 40th St., New York, 16
(Micro-Cel, Celite)

Kenite Corp.
Overhill Bldg., Scarsdale, N. Y.
(Kenite 75)

Kennedy Minerals Co.
2550 E. Olympic Blvd., Los Angeles 23

W. H. Loomis Talc Corp.
Gouverneur, N. Y.

Magnet Cove Barium Corp.
PO Box 6504, Houston 5, Tex.
(Carriclay, Pulgite, Arrowhead)

Mill White Clay Co.
Attapulgus, Ga.

Minerals & Chemicals Philipp Corp.
Menlo Park, N. J.
(Attaclay)

Minco Products Corp.
PO Box 367, Saginaw, Mich.

National Kaolin Products Co.
Aiken, S. C.

Quaker Oats Co., Chemicals Div.
Merchandise Mart, Chicago 54

Southeastern Clay Co.
PO Box 636, Aiken, S. C.
(Velvex)

A. E. Staley Mfg. Co. (Lo-Fat Soy Flour)
Decatur, Ill.

Star Enterprises, Inc.
212 York St., Cassopolis, Mich.
(Creek-O-Nite)

Summit Mining Corp. (Ser-X)
Bashore Bldg., Carlisle, Pa.

Tamms Industries, Inc.
228 N. LaSalle St., Chicago, 1

Thomas Alabama Kaolin Co.
2412 Ken Oak Rd., Baltimore 9, Md.
(Tako)

United Clay Mines Corp.
Trenton 6, N. J.
(Dilex, Barnett, Franklin)

United-Heckathorn
600 S. 4th St., Richmond, Calif.
(Silikil)

Vanderbilt Co., R. T.
230 Park Ave., New York, 17
(Pyrax, Continental)

Whittaker, Clark & Daniels, Inc.
100 Church St., New York 7

Zonolite Co.
1827 Benson St., Evanston, Ill.
(Terralite)

DISINFECTANTS, SEED — See Fungicides

DISPERSANTS — See spreaders-stickers

DRUMS (Fibre)

Bennett Industries
122 N. Washington St., Peotone, Ill.

Benson Fibre Drum Co.
186 Van Dyk St., Bklyn.

Buffalo-Carpenter Container Corp.
P. O. Box 518, Niagara Falls, N. Y.

Carpenter Container Corp.
147 41st St., Brooklyn 32

Continental Can Co.
100 E. 42nd St., N. Y. 17

Emery-Carpenter Container Co.
Carew Tower, Cincinnati

Federal Fibre Corp.
3704 10th St., L. I. C., N. Y.

Fibre Drum Co.
20 N. Wacker Dr., Chicago 6

Master Package Corp.
Owen, Wisc.

Monmouth Container Corp.
Matawan, N. J.

Plyfiber Container Corp.
650 South Ave., Garwood, N. J.

Rheem Mfg. Co.
1701 Edgar Rd., W., Linden, N. J.

Seymour & Peck Co.
Blue Island, Ill.

Virginia Barrel Co.
P. O. Box 86, Staten Island, N. Y.

DRUMS (Metal)

Bennett Industries
122 N. Washington St., Peotone, Ill.

Continental Can Co.
100 E. 42nd St. N. Y. 17

Delaware Barrel & Drum Co.
Wilmington, Del.

Eastern Steel Barrel Corp.
3021 Lincoln Blvd., Bound Brook, N. J.

Florida Drum Co.
208 E. Liberty St., Pensacola, Fla.

Geuder, Paeschke & Frey Co.
324 N. 15 St., Milwaukee

Inland Steel Container Co.
30 W. Monroe, Chicago

Jones & Laughlin Steel Corp.
3 Gateway Center, Pittsburgh

Manion Steel Barrel Co.
Rouseville, Pa.

Myers Drum Co.
6549 San Pablo Ave., Oakland, Calif.

National Steel Container Corp.
Chicago 38

Nesco, Inc.
270 N. 12th St., Milwaukee 1

Newark Steel Drum Co.
Linden, N. J.

Ohio Corrugating Co.
Warren, O.

Reliable Steel Drum Co.
808 Union Ave., Bridgeport, Conn.

Republic Steel Corp.
Republic Bldg., Cleveland 1

Rheem Mfg. Co.
1701 Edgar Rd., W., Linden, N. J.

Southern States Containers
2830 5th Ave., North, Birmingham, Ala.

U. S. Steel Prods. Co.
30 Rockefeller Plaza, N. Y. 20

United States Barrel Co.
225 S. 15th St., Phila. 2

Vulvan Containers, Inc.
Bellwood, Ill.

Vulcan Steel Container Co.
3315 N. 35th Ave., Birmingham, Ala.

Wheeling Steel Corp.
Wheeling, W. Va.

DRUM HANDLER

Specialty Machinery Corp.
50 Roanoke Ave., Newark 5, N. J.

DRYERS — COOLERS

Davidson-Kennedy Co.
Box 97, Station D, Atlanta

Fertilizer Engineering & Equipment Co.
Green Bay, Wisc.

General American Transportation Corp.
Louisville, Ky.

Hardinge Co.
York, Pa.

Kennedy-Van Saun Mfg. & Eng'g Corp.
405 Park Ave., N. Y. 22

Link Belt Co.
Prudential Plaza, Chicago 1

McDermott Bro. Co.
Washington & 3rd, Allentown, Pa.

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24

A. J. Sackett & Sons
1737 S. Highland Ave., Baltimore, Md.

Standard Steel Corp.
P. O. Box 58252, Los Angeles 58

DUST COLLECTORS

BIF Industries, Inc.
536 Harris Ave., Providence 1, R. I.

Day Co.
810 3rd Ave. N. E., Minneapolis

Davidson Kennedy Co.
Box 97, Station D, Atlanta

Dustex Corp.
1758 Waldemere St., Buffalo, N. Y.

Fertilizer Engineering & Equip. Co.
Memorial Drive, Green Bay, Wisc.

Air Pollution Control
DUST COLLECTOR
Multi-Wash collects odors, fumes and dusts efficiently and economically
CLAUDE B. SCHNEIBLE CO.
2827 25th Street
Detroit 32, Michigan
See advertisement on Page 100

DUST COLLECTORS (Contd.)

Joy Manufacturing Co.
401 Oliver Bldg., Pittsburgh

Pulverizing Machinery Div.
American-Marietta Co.
63 Chatham Rd., Summit, N. J.

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24

A. J. Sackett & Sons
1737 S. Highland Ave., Baltimore

Claude B. Schneible Co.
2827 25th St., Detroit, Mich.

Wheelabrator Corp.
Mishawaka, Ind.

DUST MASKS — See Masks

ELEVATORS

Atlanta Utility Works
East Point, Ga.

Beaumont Birch Co.
1505 Race St., Philadelphia 2

Chain Belt Co.
4795 W. Greenfield Ave., Milwaukee 1

Davidson Kennedy Co.
Box 97, Station D, Atlanta

Fertilizer Engineering & Equipment Co.
Green Bay, Wisc.

Jeffrey Mfg. Co.
E. First Ave. & 4th St., Columbus 16

Kennedy-Van Saun Mfg. & Engr. Corp.
405 Park Ave., New York

New London Engineering Co.
New London, Wisc.

Link Belt Co.
Prudential Plaza, Chicago 1

Sturtevant Mill Co.
123 Clayton St., Boston 22

EMULSIFIERS

Armour Ind. Chem. Co.
110 N. Walker Drive, Chicago 6, Ill.

Atlas Powder Co., Chemicals Div.
Wilmington 99, Del.
(Atlox)

Antara Chemicals Div.,
General Aniline & Film Corp.
435 Hudson St., New York 14
(Antarite)

National Aniline Div.,
Allied Chem. Corp.
40 Rector St., New York

Nopco Chemical Co.,
60 Park Pl., Newark, N. J.
(Agrimuls)

Process Chemicals Co.
8733 S. Dice Rd., Santa Fe Spr., Cal.

Rohm & Haas Co.
222 W. Washington Sq., Philadelphia
(Tritons)

L. Sonneborn Sons, Inc.
300 Fourth Ave., New York 10

Stepan Chemical Co.
Edens & Winnetka, Northfield, Ill.
(Toximuls)

Sole Chemical Corp.
7740 S. Chicago Ave., Chicago 19
(Sole A Mulse)

Thompson-Hayward Chemical Co.
2915 Southwest Blvd.
Kansas City, Mo.

Witco Chemical Co.
122 E. 42nd St., New York 7
(Emcol)

ENDRIN — See Insecticides

ENGINEERS—See Fertilizer Plants

FEED SUPPLEMENTS — See Animal Feed Supplements

FEEDERS

Atlanta Utility Works
East Point, Ga.

BIF Industries
536 Harris Ave., Providence 1, R. I.

Davidson Kennedy Co.
P. O. Box 97, Station D, Atlanta

Hardinge Co.
240 Arch St., York, Pa.

Jeffrey Mfg. Co.
E. First Ave. & 4th St., Columbus 16

C. S. Johnson Co., Div. Koering Co.
Champaign, Ill.

Kennedy-Van Saun Mfg. & Engr. Corp.
405 Park Ave., New York

Pulva Corp.
505 High St., Perth Amboy, N. J.

A. J. Sackett & Sons
1737 S. Highland Ave., Baltimore

Schaffer Poidometer Co.
2828 Smallman St., Pittsburgh 22

Syntron Co.
579 Lexington Ave., Homer City, Pa.

Weighing & Control Components, Inc.
206-P Lincoln Ave., Hatboro, Pa.

FERTILIZER PLANTS (Design, Engineering and Construction)

Atlanta Utility Works
East Point, Ga.

Barnard & Leas Mfg. Co.
1234 12th St., S.W., Cedar Rapids, Ia.

Blaw Knox Co.
300 6th St., Pittburgh 22, Pa.

Blue Valley Equipment Mfg. & Engineering Co.
Laurent & N. Taylor Sts., Topeka, Kans.

Butler Mfg. Co.
7400 E. 13th St., Kansas City 26

J. C. Carlile Corp.
Cooper Bldg., Denver 2, Colo.

Chemical Construction Corp.
525 W. 43rd St., N. Y. 36

Chemical & Industrial Corp.
Cincinnati, Ohio

Davidson-Kennedy Co.
1090 Jefferson SW, Atlanta, Ga.

Dorr-Oliver, Inc.
Stamford, Conn.

Fertilizer Eng'g & Equipment Co.
Memorial Drive, Green Bay, Wisc.

EMCOLS
to produce top-quality concentrates of a wide range of chlorinated hydrocarbon and organic phosphate toxicants H-300X • H-500X • H-710 • H-712 • H-714 • H-140 • H-141 • H-A • H-B • H-C
WITCO CHEMICAL CO.
122 E. 42nd St., New York 17
See advertisement on Pages 30, 31

TOXIMULS R and S
Agricultural Emulsifiers
R and S emulsify any pesticide—weed killers, chlorinated or phosphate insecticides, fungicides, etc.
STEPAN CHEMICAL CO.
Edens & Winnetka, Northfield, Ill.
See advertisement on Page 49

OMEGA FEEDERS
Weighing feeders for blending or feeding dry ingredients . . . ammonia rock dust, solid nitrogen, potash, super, triple - super, etc.
BIF INDUSTRIES, INC.
536 Harris Ave., Providence, R. I.
See advertisement on Page 124

PRODUCTION EQUIPMENT

- Coolers • Dryers
- Mixers • Mills
- Granulartors
- Ammoniators

A. J. SACKETT & SONS CO.
1737 S. Highland Ave.,
Baltimore, Md.
See advertisement on Page 102

Methyl Bromide
FUMIGANT
for killing pests and rodents
- non explosive
- non flammable
- no residual odor or taste

KOLKER CHEMICAL CORP.
600 Doremus Avenue
Newark 5, N. J.
See advertisement on Page 47

FUNGICIDES
HERBICIDES
Amobam • Nabam • Diram
Thiram • Ferbam • Ziram

ROBERTS CHEMICALS, INC.
Nitro, West Virginia
See advertisement on Page 125

ZINEB
wettable powders and
technical concentrates
Ferbam — Thiram — Nabam
Ziram — Lindane

SHEPARD DIVISION
SAMINCORP, South American
Minerals & Merchandise Corp.
425 Park Avenue
New York 22, N. Y.
See advertisement on Page 120

W. A. **CLEARY** CORP.
New Brunswick, New Jersey
Belleville, Ont., Canada
- Thiram Fungicides
- Mercurial Fungicides
- Cadmium Fungicides
- Disodium Methyl Arsonate Crabgrass Killer
- Amine Methyl Arsonate Crabgrass Killer
- Insecticide Formulators

See advertisement on Page 141

FERTILIZER PLANTS (Contd.)

Fluor Corp., Ltd.
2500 S. Atlantic St., Los Angeles 22

Foster Wheeler Corp.
666 5th Ave., New York

General Industrial Development Corp.
270 Park Ave., N. Y. 17
Agents for St. Gobain Process for mfg. nitrophosphate fertilizers

Girdler Corp.
Louisville, Ky.

M. W. Kellogg Co.
711 Third Ave., New York

Leonard Construction Co.
37 S. Wabash Ave., Chicago 3, Ill.

Longhorn Construction Co.
P. O. Box 336, Sulphur Springs, Tex.

Lummus Co.
385 Madison Ave., N. Y. 17

Luria Engineering Co.
511 5th Ave., New York

Manitowoc Shipbuilding, Inc.
Chemical Engineering Service Div.
Manitowoc, Wisc.

F. H. McGraw
51 E. 42nd St., New York

Midstates Machinery
359 E. Main St., Decatur, Ill.

Robert F. McCloskey Engineering Co.
Highland Bldg., E. Liberty, Pa.

Poulsen Co.
2341 8th St., Los Angeles 21

A. J. Sackett & Sons
1737 S. Highland St., Baltimore

Saumico Engineering Co.
Saumico, Wisconsin

Standard Steel Mfg. Co.
2137 N. Sherman Dr., Indianapolis

Titlestad Corp.
521 Fifth Ave., New York

Vulcan Engineering
120 Sycamore, Cincinnati

D. M. Weatherly Co.
80 Eleventh St., Atlanta, Georgia

Whiting-Turner Contracting Co.
6229 Charles St., Baltimore 12

FLUORIDES — See Insecticides

FORMULATORS—See Insecticide Formulators

FRONT END LOADERS — See Tractor Shovels

FUMIGANTS (For stored grain, etc.)

American Cyanamid Co.
30 Rockefeller Plaza, New York

American Potash & Chem. Corp., Eston Div.
3000 West Sixth St.,
Los Angeles 54

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14

Dow Chemical Co.
Midland, Mich.

Frontier Chemical Co.
Div. Vulcan Materials Co.
Wichita 1, Kans.

Great Lakes Chemical Corp.
500 Fifth Ave., New York 36

Kolker Chemical Corp.
600 Doremus Ave., Newark 5, N. J.

Michigan Chemical Corp.
St. Louis, Mich.

Shell Chemical Corp.
50 W. 50th St., New York

FUMIGANTS, SOIL — See Nematocides

FUMIGATION TARPAULINS—See Tarpaulins

FUNGICIDES

American Cyanamid Co.
30 Rockefeller Plaza, New York
(Cyprex)

Berkshire Chemicals, Inc.
420 Lexington Ave., N. Y. 17
(Dithiocarbamates, Mercury Cmpds.)

California Spray Chemical Corp.
Richmond, Calif.
(Phaltan)

Calumet Div., Calumet & Hecla, Inc.
9 Calumet Ave., Calumet, Mich.
(Fungicide Grade Copper Oxide)

Carbide & Carbon Chemicals Div., Union Carbide Corp.
30 E. 42nd St., New York 17
(Glyodin)

Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.

Chemical Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.
(Chem-Bam)

Chipman Chemical Co.
Bound Brook, N. J.
(Chipcote)

W. A. Cleary Corp.
P.O. Box 749, New Brunswick, N. J.
(Phenyl Mercury Acetate)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(Hexachlorobenzene, seed protectant)

Dow Chemical Co.
Midland, Mich.
(Dowicides)

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(Dithiocarbamates, Coppers, Mercurials, Wettable Sulfurs)

Faesy & Besthoff, Inc.
25 E. 26 St., New York 10
(Copper Sulfate, Nabam)

FUNGICIDES (Contd.)

Frontier Chemical Co.
Div. Vulcan Materials Co.
Wichita 1, Kansas
(Pentachlorophenol)

Gallowhur Chemical Corp.
N. Water St., Ossining, N. Y.
(Organo-Mercury Compounds)

Irvington Smelting & Refining Co.
374 Nye Ave., Irvington, N. J.

Kalo Inoculant Co.
525 Kentucky St., Quincy, Ill.
(Seed Treatment)

Metal & Thermit Co.
Rahway, N. J.

Metalsalts Corp.
200 Wagrow Rd., Hawthorne, N. J.
(Mercury Compounds)

Merck & Co.
Rahway, N. J.
(Antibiotics)

Mallinckrodt Chemical Works
3600 Second St., St. Louis
(Mercury Compounds)

Miller Chemical & Fertilizer Corp.
Baltimore 15, Md.
(Copper-Zinc-Chromate Complex)

Monsanto Chemical Co.
St. Louis, Mo.
(Ortho nitro chlorobenzene, Pentachlorophenol)

Morton Chemical Co., Agricultural Div.
110 N. Walker Dr., Chicago 6

Nationwide Chemical Co.
P. O. Box 775, Fort Myers, Fla.
(Nabac-25)

Naugatuck Chemical Div.
U. S. Rubber Co.
Naugatuck, Conn.
(Phygon, Spergon)

Niagara Chemical Div., Food Machinery & Chem. Corp.
Middleport, N. Y.
(Nabam, Niacide)

Olin-Mathieson Chem. Corp.
10 Light St., Baltimore 3
(Terraclor, Omazene)

Phelps Dodge Refining Corp.
300 Park Ave., New York 22
("Triangle Brand" Copper Sulphate)

Chas. Pfizer & Co.
630 Flushing Ave., Brooklyn, N. Y.
(Antibiotics)

Reade Mfg. Co.
130 Hoboken Ave., Jersey City 2, N. J.

Refined Products Corp.
Lyndhurst, N. J.
(Perma-cides)

Republic Chemical Corp.
94 Beekman St., New York 38
(Copper Sulphate)

Roberts Chemicals, Inc.
Nitro, W. Va.
(Amobam, Diram, Ferbam, Thiram, PMAC, Nabam, Ziram)

Robertson Co., H. H.
2434 Farmers Bank Bldg., Pittsburgh 22

Rohm & Haas, Inc.
Washington Sq., Philadelphia 5
(Dithane, Karathane)

Shepard Division of SAMINCORP
425 Park Ave., New York 22

Stauffer Chemical Co.
380 Madison Ave., New York 17

Tennessee Corp.
617 Grant Bldg., Atlanta
(Tri-Basic Copper Sulphate)

R. T. Vanderbilt Co.
230 Park Ave., New York 17
(Vancide)

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11
(Emmi)

Woodridge Chemical Corp.
50 Park Pl. East, Woodridge, N. J.
(Mercurials)

FURNACES — Se Refractories

GAS MASKS — See Masks

GIBBERELLIC ACID — See Plant Growth Regulators

GLOVES — See Masks

GOGGLES — See Masks

GRANULATORS — See Ammoniators

GRINDERS — See Mills

HEPTACHLOR — See Insecticides

HERBICIDES

Amchem Products Inc.
Ambler, Pa.
(2,4-D, 2,4,5-T, Amoben, Amitrol, Weedazol, Benzac-Sesone)

American Smelting & Refining Co.
120 Broadway, New York 5
(Arsenates)

Berkeley Chemical Corp.
Summit Avenue, Berkeley Heights, N. J.

Chemagro Corp.
North Mall, Willow Lawn
Richmond 30, Va.
(DEF)

Chipman Chemical Co.
Bound Brook, N. J.
(Arsenicals, Chlorates)

Union Carbide Chemicals Co. Div., Union Carbide Corp.
30 E. 42nd St., New York 17
(Sesone)

Chemical Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.
(Sodium Arsenite, Aquatic Herbicide, 2,4-D)

W. A. Cleary Corp.
P.O. Box 749, New Brunswick, N. J.

Columbia-Southern Chemical Corp.
632 Fort Duquesne Blvd., Pittsburgh 22
(Chloro-IPC)

For All Weeds
Sodium Chlorate
in a new
Sodium Chlorate
Drum
HOOKER CHEMICAL CORP.
609 Buffalo Ave.
Niagara Falls, N. Y.
See advertisement on Page 122

MANUFACTURERS OF
SODIUM ARSENITE SOLUTIONS
READE MFG. CO. INC.
130 Hoboken Avenue
JERSEY CITY 2, N. J.
PLANTS: JERSEY CITY, N. J., CHICAGO, ILL., N. KANSAS CITY, MO., BIRMINGHAM ALA., TEXARKANA, ARK.

Dow Chemical Co.
Midland, Mich.
(2, 4-D, 2,4,5-T, Forron)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(2,4-D, 2,4,5-T)

Eastman Chemical Products, Inc.
Kingsport, Tenn.
(2-ethyl hexoic acid, 2-ethyl hexyl acid, and 2-ethyl iso hexyl acid—Intermediates for production of herbicides)

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(Ammate, Dybar, Karmex, Kloben, Telvar, Trysben, Zobar)

Faesy & Besthoff, Inc.
25 East 26th St., New York 10
(Sodium arsenate solution)

General Chemical Div.,
Allied Chemical Corp.
40 Rector St., New York 6
(Calcium Arsenate Granular, HCA)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Atrazine, Simazine)

Heyden-Newport Chem. Corp.
342 Madison Ave., New York
(Trichlorobenzoic Acid)

Hooker Chemical Corp.
606 Buffalo Ave., Niagara Falls, N. Y.
(Sodium Chlorate)

Monsanto Chemical Co.
St. Louis 24, Mo.
(Randox, Vegadex)

Naugatuck Chem. Div.
U. S. Rubber Co.
Naugatuck, Conn.
(Alanap, Falone)

Pennsalt Chemicals Corp.
Tacoma, Wash.
(Endothal)

SEVIN

INSECTICIDE

SPRAY and DUST FORMULATIONS

UNION CARBIDE CHEMICALS CO.

Division of Union Carbide Corporation
270 Park Ave., New York 17, N. Y.

SEVIN is a registered trade-mark of Union Carbide Corporation.

See advertisement on Page 135

PENCO

Agricultural Chemicals

PENNSALT CHEMICALS CORP.

Tacoma 1, Washington

See advertisement on Page 98

DDT
Custom Grinding
Fertilizers

LEBANON CHEMICAL CORP.

P. O. Box 532, Lebanon, Pa.

See advertisement on Page 139

Technical, Pulverized

LINDANE

95% through 325 Mesh

MARKS & LEEDS CO., LTD.

P.O. Box 43-106, S. Miami, Fla.

See advertisement on Page 144

CHIPMAN

- Insecticides
- Fungicides
- Herbicides
- Defoliants

CHIPMAN CHEMICAL CO.

Boundbrook, N. J.

See advertisement on Page 146

HERBICIDES (Contd.)

Reade Mfg. Co.
135 Hoboken Ave., Jersey City 2, N. J.

Reasor-Hill Corp.
Box 36, Jacksonville, Ark.
(Aquatic Herbicide)

Roberts Chemicals, Inc.
Nitro, W. Va.
(Herbisan 5)

Shell Chemical Corp.
460 Park Ave., New York 22
(Aqualin, aquatic herbicide)

Standard Agricultural Chemicals, Inc.
1301 Jefferson St., Hoboken, N. J.
(Sinox PE, dinitro)

Stauffer Chemical Co.
380 Madison Ave., New York 17
(Eptam)

Thompson-Hayward Chemical Co.
2915 Southwest Blvd., Kansas City, 8
(2,4-D and 2,4,5-T)

U. S. Borax
630 Shatto Pl., Los Angeles 5
(Ureabor, Polybor-chlorate, Borascu)

Virginia-Carolina Chemical Corp.
Richmond, Va.
(V-C Folex, cotton defoliant)

HORMONES — See Plant Growth Regulators

INSECTICIDE FORMULATORS
(manufacturers of finished pesticides for sale in bulk

Acock Laboratories,
2700 E. 5th St., Austin, Tex.

Agricultural Chemicals, Inc.
Walnut Grove, Calif.

Agricultural Chemicals, Inc.
Llano, Texas

Agricultural Chemical Service Co.
Montgomery, Ala.

Agricultural Pesticide Chemical Co.
Hibernia Bldg., New Orleans, 12

California Spray-Chemical Corp.
Richmond, Calif.

Carolina Chemicals, Inc.
P. O. Box 138, West Columbia, S. Car.

Central Chem. Co.
49 N. Jonathan St., Hagerstown, Md.

Chapman Chem. Co.
38 Court St., Memphis, Tenn.

Chem. Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.

Chipman Chemical Co.
Bound Brook, N. J.

William Cooper & Nephews,
1909 Clifton St., Chicago

Corona Chemical Div.
Pittsburgh Plate Glass Co.
Pittsburgh, Pa.

Douglas Chem. Co.
620 E. 16th Ave., N. Kansas City, Mo.

Durham Chem. Co.
4124 E. Pacific Way, Los Angeles

Faesy & Besthoff, Inc.
25 East 26th St., New York 10

Flag Sulphur & Chem. Co.
Tampa, Fla.

Florida Agricultural Supply Co.
Box 658, Jacksonville, Fla.

Fresno Agricultural Chem. Co.
Fresno, Calif.

Georgia-Carolina Oil Co.
1403 Sixth St., Macon, Ga.

Hayes-Sammons Co.
Mission, Texas

Howerton Gowen Co.
East 11th St., Roanoke Rapids, N. C.

Kwik-Way Chem. Co.
Box 2536, San Antonio, Texas

O. E. Linck Co.
Route 6 & Valley Rd., Clifton, N. J.

C. J. Martin & Sons
413 Chicon St., Austin, Texas

Millmaster Chem. Corp.
295 Madison Ave., New York 17

Naco Fertilizer Co.
Box 858, Charleston, S. C.

Oregon Agricultural Chemicals,
Tulelake, Calif.

W. R. Peele Co.
516 S. Salisbury St., Raleigh, N. C.

Phoenix Chem. Co.
19th Ave. & Roosevelt, Phoenix, Ariz.

Plainsman Supply Co.
Plainview, Texas

Planters Chemical Corp.
3111 Virginia Beach Blvd., Norfolk, Va.

Your advertisement in this space reaches 10,000 prospective buyers of herbicides, or formulators of pesticides. Reserve space for the 1961-62 edition.

AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

Frontier

B H C

offered in low gamma or high gamma concentrations

Kills Boll Weevil

FRONTIER CHEMICAL CO.
Division Vulcan Materials Co.
P.O. Box 545, Wichita, Kansas

See advertisement on Page 29

INSECTICIDE FORMULATORS (Contd.)

Port Fertilizer & Chem. Co.
Los Fresno, Tex.

Private Brands, Inc.
300 S. 3rd St., Kansas City, Kan.

Quality Chemical Corp.
Box 564, Memorial Ave., Greenville, N. C.

Ralston Purina Co.
835 S. 8th St., St. Louis

Reasor-Hill Corp.
Jacksonville, Ark.

Riverdale Chemical Co.
Chicago Heights, Ill.

Shepard Division of SAMINCORP
425 Park Ave., New York 22

Sherwin-Williams Co.
101 Prospect Ave., N.W., Cleveland 1

Southwest Co-operative Wholesale
1821 E. Jackson St., Phoenix, Ariz.

Taylor Chemical Co.
Aberdeen, N. C.

Thompson-Hayward Chemical Co.
2915 S. W. Blvd., Kansas City

Tyner-Petrus Co.
100 Trenton St., West Monroe, La.

F. H. Vahlsing
Elsa, Texas

INSECTICIDES, TECHNICAL (Concentrates and basic raw materials for use in the manufacture of finished formulations) including Arsenicals, Chlorinated Hydrocarbons and Phosphates

American Cyanamid Co.
30 Rockefeller Plaza, N. Y.
(Parathion, Dicapthon, Malathion)

American Potash & Chem. Corp., Eston Div.
3000 W. 6th St., Los Angeles 54
(Ethyl Parathion, Tetraethyl Pyrophosphate)

American Smelting & Refining Co.
120 Broadway, New York 5
(Arsenates)

Union Carbide Chemicals Co. Div., Union Carbide Corp.
270 Park Ave., New York 17
(Sevin)

Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.
(Parathion, Methyl Parathion)

Chipman Chemical Co.
Bound Brook, N. J.
(Arsenates)

W. A. Cleary Corp.
P. O. Box 749, New Brunswick, N. J.
(Arsenates)

Commercial Solvents Corp.
260 Madison Ave., New York 16
(Dilan, Metaldehyde)

Diamond Alkali Co.
300 Union Commerce Bldg., Cleveland
(BHC, Lindane, DDT, TEPP)

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(DDT, Methoxychlor)

Durham Chemical Co.
4124 E. Pacific Way, Los Angeles 23
(DDT, Parathion)

Eastman Chemical Products, Inc.
Kingsport, Tenn.
(Triethyl Phosphate—intermediate for TEPP)

Fairfield Div., FMC
441 Lexington Ave., New York 17

Flag Sulphur & Chem. Co.
P. O. Box 5737, Tampa 5, Fla.
(DDT, Parathion, Malathion)

Frontier Chemical Co., Div. Vulcan Materials Co.
Wichita 1, Kans.
(BHC)

General Chem. Div., Allied Chem. Corp.
40 Rector St., New York 6
(BHC, DDT, TDE, Calcium Arsenate)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Methoxychlor, DDT, Diazinon)

R. W. Greeff & Co.
10 Rockefeller Plaza, New York 20
(DDT, DDVP)

Harshaw Chemical Co.
1945 East 87th St., Cleveland 6, Ohio
(Cryolite)

Hercules Powder Co.
900 Market St., Wilmington, 99, Del.
(Toxaphene, Thanite, Delnav)

Heyden Newport Chem. Corp.
Heyden Chemical Div.
342 Madison Ave., New York 17
(Chlorotoluene derivatives)

Lebanon Chemical Co.
Lebanon, Pa.
(DDT)

Marks & Leeds Co., Ltd.
P.O. Box 43-106, S. Miami, Fla.

Michlin Chemical
9045 Vincent St., Detroit, Mich.
(DDT)

Monsanto Chemical Co.
St. Louis, Mo.
(Parathion, Methyl Parathion)

Niagara Chemical Div., FMC
Middleport, N. Y.
(BHC, DDT, Lindane, TEPP, Thiodan, Ethion, Phostex, Tedion)

Olin-Mathieson Chemical Corp.
10 Light St., Baltimore
(DDT, BHC)

S. B. Penick & Co.
4161 Beck Ave., St. Louis 16
(Chlordane, Lindane, DDT, Malathion)

Pennsalt Chemicals Corp.
Tacoma, Wash.
(BHC, DDT, Lindane, Malathion)

Prentiss Drug & Chemical Co.
101 West 31st St., New York 1
(Chlordane, DDT, Lindane, Malathion)

TOXAPHENE
for insect control
particularly on cotton pests
HERCULES POWDER CO.
900 Market St.
Wilmington 99, Del.
See advertisement on 4th cover

HEPTACHLOR
ENDRIN
CHLORDANE
VELSICOL CHEMICAL CORP.
330 East Grand Ave., Chicago 11
See advertisement on Page 32

SILIKIL
silica gel
dense silica insecticide
that stays where it's laid
UNITED HECKATHORN
600 S. Fourth St., Richmond, Calif.
See advertisement on Page 144

Geigy
Agricultural Chemicals
Diazinon Insecticide
Methoxychlor Insecticide
Atrazine Herbicide
Simazine Herbicide
Chlorobenzilate Miticide
Sequestrene Chelates
Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
See advertisement on Page 21

Complete Pesticide Line
Tedion - Thiodan - Ethion - COCS
Niacide - Kilodust - Kolofog -
Bedrench - Phos Kil - Pyrenone
Suspenso Lead Arsenate - Stikcol
BHC - DDT - SULFUR
Calcium Arsenate - Quick-Kill
NIAGARA CHEMICAL DIVISION, FMC
Middleport, New York
See advertisement on Page 88

BUTONATE

- residual action against insects
- low in toxicity to mammals
- non staining
- inoffensive odor
- soluble in most organic solvents

PRENTISS DRUG & CHEMICAL CO.
101 W. 31 St., New York 1, N. Y.
See advertisement on Page 14

PYRENONE

for pesticide formulation

- dairy sprays
- residual concentrates
- house & garden products
- industrial aerosols
- fly repellents

FAIRFIELD CHEMICALS, FMC
441 Lexington Ave., New York 17
See advertisement on Page 16

Powdered

CUBE

Controls vegetable weevil, Japanese beetle, raspberry cane borer and many other chewing and sucking insects.

S. B. PENICK & CO.
4161 Beck Ave., St. Louis 16, Mo.
See advertisement on Page 23

INSECTICIDES, TECHNICAL (Contd.)

Rohm & Haas Co.
Washington Sq., Philadelphia 5
(Perthane, Rhothane, Lethane)

Shell Chemical Corp.
460 Park Ave., New York 22
(Aldrin, Dieldrin, Endrin, Phosdrin, Methyl Parathion)

Sherwin-Williams Co.
101 Prospect Ave., N.W., Cleveland 1
(Arsenicals)

Stauffer Chemical Co.
380 Madison Ave., New York 17
(Parathion, Trithion, DDT, Aramite)

United-Heckathorn Co.
600 S. 4th St., Richmond, Calif.
(DDT, Cryolite)

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11
(Chlordane, Endrin, Heptachlor, Parathion, Methyl Parathion)

Victor Chemical Works
Div. of Stauffer Chemical Co.
155 N. Wacker Dr., Chicago 6
(Methyl Parathion)

INSECTICIDES, BOTANICAL (Pyrethrum, Rotenone, Allethrin, Cube, Derris, Ryania, Sabadilla, etc.)

Chemical Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.

Fairfield Chemical Div., FMC
441 Lexington Ave., New York 17

McLaughlin Gormley King Co.
1715 S. E. 5th St., Minneapolis

S. B. Penick & Co.
4161 Beck Ave., St. Louis 16

Prentiss Drug & Chem. Co.
101 West 31st St., New York 1

INSECTICIDES, MICROBIAL

Bioferm Corp.
Wasco, Calif.
(Thuricide)

Merck & Co. (Bacillus Thuringiensis)
Rahway, N. J.

INSECTICIDES (Trade or Common Name Products)

Aldrin
Shell Chemical Corp.
460 Park Ave., New York 22

Aramite
Naugatuck Chemical Div.,
U. S. Rubber Co.
Naugatuck, Conn.

Butonate
S. B. Penick & Co.
4161 Beck Ave., St. Louis 16

Prentiss Drug & Chem. Co.
101 West 31st St., New York 11

Chlordane
Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11

Chlorobenzilate
Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.

Co-Ral
Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.

Delnav
Hercules Powder Co.
900 Market St., Wilmington 99, Dela.

Diazinon
Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.

Dicapthon
American Cyanamid Co.
30 Rockefeller Plaza, New York

Dieldrin
Shell Chemical Corp.
460 Park Ave., New York 22

Dilan
Commercial Solvents Corp.
260 Madison Ave., New York 16

Dipterex
Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.

Dri-Die
Davison Chemical Div., W. R. Grace & Co.
Baltimore 3, Md.

Dylox
Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.

Endrin
Shell Chemical Corp.
460 Park Ave., New York 22

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago

Ethion
Niagara Chemical Div., Food Machinery & Chem. Corp.
Middleport, N. Y.

Guthion
Chemagro Corp.
North Mall, Willow Lane, Richmond 30, Va.

Heptachlor
Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11

Kelthane
Rohm & Haas Co.
Washington Sq., Phila. 5

Lethane
Rohm & Haas Co.
Washington Sq., Phila. 5

Malathion
American Cyanamid Co.
30 Rockefeller Plaza, New York

Metaldehyde
Commercial Solvents Corp.
260 Madison Ave., New York 16

OMPA, (Sytam)
Pennsalt Chemicals Corp.
Tacoma, Wash.

Perthane
Rohm & Haas Co.
Washington Sq., Philadelphia 5

Phosdrin
Shell Chemical Corp.
460 Park Ave., New York 22

Phosphamidon
California Spray Chem. Corp.
Richmond, Calif.

Phostex
Niagara Chemicals Div., FMC
Middleport, N. Y.

Pyrenone
Fairfield Chemicals Div., FMC
441 Lexington Ave., New York 17

Rhothane
Rohm & Haas Co.
Washington Sq., Phila. 5

Sevin
Union Carbide Chemicals Co. Div.,
Union Carbide Corp.
270 Park Ave., New York 17

Silikil
United Heckathorn
6008 4th St., Richmond, Calif.

Strobane
Heyden Newport
342 Madison Ave., New York

INSECTICIDES (Trade or Common name products) (Contd.)

Systox
Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.

Sytam
Pennsalt Chemicals Corp.
Tacoma, Wash.

TDE
General Chemical Div.
Allied Chemical Corp.
40 Rector St., New York 6

Tedion
Niagara Chemical Div., FMC
Middleport, N. Y.

Thimet
American Cyanamid Co.
30 Rockefeller Plaza, New York

Thiodan
Niagara Chemical Div. FMC
Middleport, N. Y.

Thiram
Pennsalt Chemicals Corp.
Tacoma, Wash.

Thanite
Hercules Powder Co.
900 Market St., Wilmington 99, Del.

Toxaphene
Hercules Powder Co.
900 Market St., Wilmington 99, Del.

Trithion
Stauffer Chemical Co.
380 Madison Ave., New York 17

Trolene
Dow Chemical Co.
Midland, Mich.

LABEL AND PACKAGE DESIGN

Cameo Die & Label Co.
154 W. 14th Street, New York 11 N. Y.

Richard de Bang Co.
826 Seventh Avenue, New York 17

Donrico Inc.
438 West 37th Street, New York 18

Walter Frank Organization
4100 Warren Avenue, Hillside, Ill.

Donald Palmer, Inc.
2627 Tchoupitoulas St., New Orleans

A. H. Wirz, Inc.
Fourth & Townsend Sts., Chester, Pa.

LABELERS

Burt Machine Co.
401 E. Oliver Street, Baltimore 2, Md.

Industrial Marking Equipment Co.
454 Baltic St., Brooklyn 17

Labelette Co.
2611 D. Leland Ave., Chicago 25, Ill.

Potdevin Machine Co.
200 North Street, Teterboro, N. J.

Standard-Knapp Division,
Emhart Manufacturing Co.
Main Street, Portland, Conn.

LABORATORY APPARATUS AND EQUIPMENT

Analytical Measurements, Inc.
585 Main St., Chatham, N. J.
(pH meter)

Beckman Instruments Inc
2500 Fullerton Rd., Fullerton, Calif.

Burrell Corp.
2223 Fifth Ave., Pittsburgh

Cargille Scientific, Inc
117 Liberty St., N. Y. 6

Central Scientific Co.
1700 W. Irving Pk., Chicago

Eimer & Amend
633 Greenwich St., New York, N. Y.

Fisher Scientific Co.
717 Forbes St., Pittsburgh

Emil Greiner Co
161 Avenue of Americas, N. Y.

Harshaw Chemical Co., Scientific Div.
Hastings-on-Hudson, N .Y.

Kensington Scientific Corp.
99 Rincon Rd., Berkeley 7, Calif.

Kimble Glass Co.
Toledo 1, O.

Labline, Inc
3070 W. Grand St., Chicago
(Rooms for plant & soil study)

Laboratory Furniture Co.
Mineola, L. I., New York

Laboratory Construction Co.
111 Holmes St., Kansas City, Mo.

Soiltest, Inc.
60 E. 42nd St., New York, N. Y.

Standard Scientific Supply Corp.
808 Broadway, New York 3

Arthur H. Thomas Co.
Vine St. at 3rd., Phila.

Will Corp.
Rochester, N. Y.

LABORATORY CHEMICALS (Reagents)

J. T. Baker Chemical Co.
Phillipsburg, N. J.

Fine Organics, Inc
205 Main St., Lodi, N. J.

Fisher Scientific Co.
717 Forbes St., Pittsburgh

General Chemical Div.
40 Rector St., N. Y.

Harshaw Chemical Co.
1945 E. 97th St., Cleveland

Mallinckrodt Chemical Works
3600 N. 2nd St., St. Louis

Merck & Co.
Rahway ,N. J.

Arthur H. Thomas Co.
Vine St., at 3rd., Phila.

LEAD ARSENATE — See Insecticides

LIFT TRUCKS

Allis-Chalmers Mfg. Co.
1150 S. 70 St., Milwaukee 1, Wis.

Barrett-Cravens Co.
630 Dundee Rd., Northbrook, Ill.

Clark Equipment Co.
2463 Pipestone Rd.,
Benton Harbor, Mich.

Elwell-Parker Co.
4205 St. Clair Ave., Cleveland

Lewis Shepard Products
125 Walnut St., Watertown, Mass.

Mercury Mfg. Co.
350 Fifth Ave., New York

Yale & Towne Mfg. Co.
11000 Roosevelt Blvd., Philadelphia

LIME

American Limestone Co.
Knoxville, Tenn.

Ashcraft Wilkinson Co.
Atlanta Ga.

Dolcito Quarry Co.
Birmingham, Ala.

Marble Products Co. of Georgia
First National Bank Bldg., Atlanta 3,

Moores Lime Co.
Springfield, O.

National Lime & Stone Co.
Findlay, Ohio

U. S. Gypsum Co.
300 W. Adams St., Chicago 6

West End Chemical Co.
1956 Webster, Oakland 12, Calif.

Willingham-Little Stone Co.
Fulton National Bank Bldg., Atlanta 3,

LINDANE — See Insecticides

LIQUID FERTILIZER PLANTS

Barnard & Leas Mfg. Co.
1202 Twelfth St., Cedar Rapids, Ia.

J. C. Carlile Corp.
Cooper Bldg., Denver 2, Colo.

Ris-Van, Inc.
Subsid. Stepan Chemical Co.
Belmond, Iowa

LOADERS — See also Tractor Shovels

Finco, Inc. Conveyor Div.
Aurora, Ill.
(box car loading device)

MAGNETIC SEPARATORS — See Separators, Magnetic

MALATHION — See Insecticides

MALEIC HYDRAZIDE—See Plant Growth Regulators

MASKS (Dust Masks, Gas Masks, Goggles, Respirators, etc.)

Acme Protection Equipment Co.
1202 Kalamazoo St., S. Haven, Mich.

American Optical Co.
Mechanics St., Southbridge, Mass.

Bausch & Lomb Optical Co.
Rochester 2, N. Y.

Chicago Eye Shield Co.
2727 W. Roscoe, Chicago, 35

Flexo Products, Inc.
Westlake, Ohio

Hub States Chemicals & Equip.
1255 Windsor St., Indianapolis, Ind.

Martindale Electric Co.
1367 Hird Ave., Cleveland 7, Ohio

Mine Safety Appliances Co.
201 N. Braddock Ave., Pittsburgh 8

Pulmosan Safety Equipment Corp.
644 Pacific St., Brooklyn 17

Welsh Manufacturing Co.
66 Magnolia St., Providence, R. I.

Willson Products Div., Ray-O-Vac Co.
116 Thorn St., Reading, Pa.

METAL CHELATES — See Chelating Agents

METERS AND GAUGES

Analytical Measurements
585 Main St., Chatham, N. J.
(pH meters)

Badger Meter Mfg. Co.
4545 W. Brown Deer Rd., Milwaukee

BIF Industries
536 Harris Ave., Providence, R. I.

Bin-Dicator Co.
13946 Kercheval Ave., Detroit
(Indicators, controls, switches)

Bowser, Inc.
1398 E. Creighton Ave., Ft. Wayne, Ind.

Buffalo Meter Co.
2935 Main St., Buffalo 14

Fisher & Porter Co.
1139 County Line Rd., Hatboro, Pa.

Foxboro Co.
Foxboro, Mass.

Marsh Instrument Co.
Skokie, Ill.

Neptune Meter Co.
47-25 34th St., Long Island City 1, N.Y.

Schaffer Poidometer Co.
2828 Smallman St., Pittsburgh 22

Squibb Taylor Co.
1213 S. Akard St., Dallas

METHOXYCHLOR — See Insecticides

METHYL PARATHION — See Insecticides

Bradley

Pneumatic Hercules Mill
provides uniform grinding of phosphate rock, limestone from 20 to 325 mesh

BRADLEY PULVERIZER CO.
Allentown, Pa.

See advertisement on Page 26

MINERALS, TRACE — See Trace Elements

MINOR ELEMENTS — See Trace Elements

MILLS (for pesticide grinding)

Combustion Engineering Co.,
Raymond Div.
427 W. Randolph St., Chicago 6

Fluid Energy Processing & Equipt. Co.
Richmond & Norris Sts. ,Phila. 25

Munson Mill Machinery Co.
210 Seward Ave., Utica, N. Y.

Pulverizing Machinery Div.
American-Marietta Co.
63 Chatham Rd., Summit, N. J.

Sturtevant Mill Co.
123 Clayton St., Boston 22

Williams Patent Crusher & Pulverizer Co.
813 Montgomery St., St. Louis

MILLS (for fertilizer grinding)

Abbe Engineering Co.
420 Lexington Ave., N. Y. 17

Allis-Chalmers Mfg. Co.
Milwaukee 1, Wisc.

Atlanta Utility Works
East Point, Ga.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Bradley Pulverizer Co.
Allentown, Pa.

Combustion Engineering
Raymond Pulverizer Div.
427 W. Randolph St., Chicago 6

Davidson-Kennedy Co.
1090 Jefferson St., N. W., Atlanta

Delta Mfg. Co.
603 Badgerow Bld., Sioux City, Ia.

Fertilizer Engr. & Equip. Co.
Memorial Drive, Green Bay, Wis.

Gruendler Crusher & Pulverizer Co.
2920 N. Market St., St. Louis

Hardinge Co.
York, Pa.

Inglett & Co.
Box 3425, Augusta, Ga.

Jeffrey Mfg. Co.
E. First Ave. & 4th St., Columbus 16

Kennedy-Van Saun Mfg. & Engr. Corp.
405 Park Ave., New York 22

Longhorn Construction Co.
Sulphur Springs, Tex.

Edw. Renneburg & Sons
2639 Boston St., Baltimore 24

A. J. Sackett & Sons
1701 S. Highland Ave., Baltimore

Sturtevant Mill Co.
123 Clayton St., Boston 22

William Patent Crusher & Pulverizer Co.
813 Montgomery St., St. Louis, Mo.

MIXERS — BLENDERS (Automatic, Batch)

Atlanta Utility Works (Batch)
East Point, Ga.

Andrews Machine Co.
Decatur, Ill.

Barnard & Leas Mfg. Co.
1234 12th St., S.W., Cedar Rapids, Ia.

Brower Manufacturing Co.
411 N. 3rd St., Quincy, Ill.

Combustion Engineering Co.
Raymond Pulverizer Div.
427 W. Randolph St., Chicago 6

Conn. & Co.
9 S. Marion St., Warren, Pa.

Continental Gin Co. (Batch)
Birmingham, Ala.

Craddock Equipment Co.
1507 A. St., Wilmington, Del.

J. H. Day Co.
Cincinnati 12

Davidson-Kennedy Co.
1090 Jefferson, SW, Atlanta, Ga.

Delta Manufacturing Co.
603 Badgerow Bldg., Sioux City, Ia.

Eastern Industries Inc.
Hamden 14, Conn.

Entoleter, Inc., Div. American Mfg. Co.
Box 904, New Haven, Conn.

Falcon Manufacturing Div.,
First Machinery Corp.
211 Tenth St., Brooklyn 15

Fertilizer Engineering & Equip. Co. Inc.
Green Bay, Wisc.

Gifford-Wood Co.
420 Lexington Ave., New York

Gruendler Crusher & Pulverizer Co.,
2915 N. Market St., St. Louis 6, Mo.

B. F. Gump Co.
1338 S. Cicero Ave., Chicago

Industrial Process Engineers
8 Lister Ave., Newark, N. J.

Intl. Eng. Co.
1145 Bolander St., Dayton 1, O.

C. S. Johnson Co.
Champaign, Ill.

MIXERS—BLENDERS (Contd.)

Link Belt Co.
307 N. Michigan Ave., Chicago 1

Mixing Equipment Co.
185-N Mt. Read Blvd., Rochester, N .Y.

Munson Mill Machinery Co.
210 Seward Ave., Utica, N. Y.

Paterson-Kelley Co.
East Stroudsburg, Pa.

A. E. Poulsen Co.
2341 E. 8th St., Los Angeles 21

Prater Pulverizer Co.
1829 S. 55th Ave., Chicago

Rapids Machinery Co.
Marion, Ia.

Read Standard Division
York, Pa.

George C. Rodgers Co., Inc.
2401 Third Ave., New York, 51

A. J. Sackett & Sons
1737 S. Highland St., Baltimore

Sprout, Waldron & Co.
7 Logan St., Muncy, Pa.

Schutz-O'Neil Co.
311 Portland Ave., Minneapolis 15, Minn.

Scottdel, Inc.
Swanton, O.

Stedman Foundry & Machine Co.
Aurora, Ind.

Sturtevant Mill Co.
123 Clayton St., Boston 22

Young Machinery Co.
Muncy, Pa.

Worthington Corp.
S. Second St., Plainfield, N.J.

MITICIDES

California Spray Chemical Co.
Richmond, Calif.
(Mitox, Phosphamidon)

Chemagro Corp.
N. Mall, Willow Lane,
Richmond 30, Va.
(Guthion)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(Ovex)

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(EPN-300)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Chlorobenzilate)

Hercules Powder Co.
900 Market St., Wilmington 99
(Delnav)

Niagara Chemical Div., FMC
Middleport, N. Y.
(Tedion, Ethion, Phostex)

Rohm & Haas Co.
Washington Sq., Philadelphia 5
(Kelthane)

Stauffer Chemical Co.
380 Madison Ave., New York 17
(Trithion)

NEMATOCIDES

American Potash & Chem. Corp., Eston Div.
3000 West Sixth St., Los Angeles 54
(Methyl Bromide, Ethylene Dibromide)

Union Carbide Chemicals Co. Div.,
Union Carbide Corp.
30 E. 42nd St., New York 17
(Mylone)

Dow Chemical Co.
Midland, Mich.
(D-D, Dorlone, Ethylene Dibromide, Methyl Bromide)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(PRD)

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(VPM)

Great Lakes Chemical Corp.
500 Fifth Ave., New York 36
(Methyl Bromide)

Kolker Chemical Corp.
600 Doremus Ave., Newark 5, N. J.
(Methyl Bromide)

Shell Chemical Corp.
460 Park Ave., New York 6
(Nemagon, D-D)

Stauffer Chemical Co.
380 Madison Ave., New York, 7
(Vapam)

Virginia-Carolina Chemical Co.
401 E. Main St., Richmond, Va.
(V-C 13)

NITRIC ACID

du Pont de Nemours & Co.
Wilmington, Del.

Escambia Chemical Corp.
distributor: Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg.,
Atlanta, Ga.

Monsanto Chemical Co.
1700 2nd St., St. Louis 24, Mo.

Sohio Chemical Co.
PO Box 628, Lima, O.

Spencer Chemical Co.
Dwight Bldg., Kansas City, Mo.

American Cyanamid Co.
Industrial Chemicals Div.
30 Rockefeller Plaza, New York

General Chem. Div., Allied Chem. Corp.
40 Rector St., New York 6

NITROGEN MATERIALS

LIQUIDS
Anhydrous Ammonia, and Solutions

Alabama By-Products Corp.
PO Box 354, Birmingham, Ala.
(anh. amm., N. solns.)

American Cyanamid Co.
30 Rockefeller Plaza, N. Y. 20
(anh. amm., N. solns.)

ARCADIAN NitrogenSolutions
Nitrana
Urana
U-A-S
Anhydrous Ammonia
NITROGEN DIVISION
Allied Chemical Corp.
40 Rector St., New York 6
See advertisement on Pages 83-86

Ammonia Solution
50% aqua ammonia solution
also
anhydrous ammonia, nitrogen solutions, naphthene acetic acid
TEXACO INC.
135 East 42nd St., New York 17
See advertisement on Page 132

NITROGEN MATERIALS
Nitrogen solutions • Urea (coated or uncoated) • Anhydrous ammonia • Aqua ammonia
SOHIO CHEMICAL CO.
Fort Amanda Rd., Lima, Ohio
....See advertisement on Page 27

NITROGEN SOLUTIONS
ANHYDROUS AMMONIA
STANDARD OIL COMPANY
(Indiana)
910 S. Michigan Avenue
Chicago 80, Ill.
See advertisement on Page 34

Hi-D
Ammonium Nitrate Fertilizer
Agricultural Chemicals Dept.
Commercial Solvents Corporation
260 Madison Ave., New York 16
Plant at Sterlington, La.
Serving Fertilizer Manufacturers in the South and Mid-West

Nitrogen Materials

- urea prills
- crystal urea
- urea solutions
- anhydrous ammonia

GRACE CHEMICAL CO.
Memphis, Tenn.

See advertisement on Page 4

BAY-SOL®
Nitrogen Solutions

ANHYDROUS AMMONIA
AMMO-NITE®
ammonium nitrate fertilizer

ESCAMBIA CHEMICAL CORP.
Pensacola, Florida

See advertisement on Page 117

21% Nitrogen

SULPHATE OF AMMONIA
free flowing
bagged for direct application
bulk form for mixing and blending
prompt delivery

REPUBLIC STEEL
1441 Republic Bldg., Cleve. 1, O.

See advertisement on Page 140

AMMONIUM SULPHATE

AQUA AMMONIA

NITROGEN PRODUCTS, INC.
National Bank Building
New Brunswick, N. J.

See advertisement on Page 144

UREA

Calcium Nitrate.....15½% N
Urea, Pelleted, coated.....45% N
Urea, Pelleted, not coated.....46% N
Foliar Spray Urea, Pelleted.....46% N

importers. exporters

ATKINS, KROLL & CO. LTD.
New York • California • Oregon
See advertisement on Page 126

NITROGEN MATERIALS (Liquids) (Contd.)

Armour Agricultural Chem. Co.
Atlanta, Ga.
(N. soln; anh. amm.)

Atlantic Refining Co.
260 S. Broad St., Philadelphia
(anh. amm.)

Columbia Southern Chemical Corp.
Div. of Pittsburgh Plate Glass
632 Fort Duquesne Blvd., Pittsburgh 22
(anh. amm.)

Commercial Solvents Corp.
260 Madison Ave., N. Y. 16
(anh. amm., N. solns., aqua amm.)

Dow Chemical Co.
Midland, Mich.
(anh. amm.)

E. I. du Pont de Nemours & Co.
Industrial & Biochemicals Dept.
Wilmington 98, Del.
(N. solns.)

Escambia Chemical Corp.
exclusive distributor:
Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg., Atlanta.
(anh. amm., N. solns.)

Grace Chemical Co.
Home Federal Bldg., Memphis
(anh. amm., amm. solns.)

Grand River Chem. Div., Deere & Co.
Pryor, Okla.
(anh. amm.)

Hercules Powder Co.
900 Market St., Wilmington, 99
(anh. amm.)

Intl. Commodities Corp.
11 Mercer St., New York 13
(N. solns)

Mid-South Chemical Corp.
1222 Riverside, Memphis, Tenn.

Monsanto Chemical Co.
1700 2nd St., St. Louis 24, Mo.
(anh. amm.)

Nitrogen Div., Allied Chem. Corp.
40 Rector St., N. Y. 6
(anh. amm., N. solns.)

Northern Chemical Industries, Inc.
Totman Bldg., Baltimore 2
(anh. amm., N. solns.)

Olin Mathieson Chemical Corp.
Little Rock, Ark.
(anh. amm., amm. sulfate, amm. phosphate, nitrate of soda)

Fertilizer Materials

- Ammonia
- Nitrogen Solutions
- Phosphoric Acid
- Sulfuric Acid

U. S. Industrial Chemicals Co.
99 Park Ave., New York 16

See advertisement on Page 116

Phillips Chemical Co.
Adams Bldg., Bartlesville, Okla.
(anh. amm., N. Solns.)

Sinclair Petrochemicals, Inc.
600 5th Ave., N. Y., 20
(anh. amm., N. solns., aqua amm.)

Sohio Chemical Co.
PO Box 628, Lima, O.
(anh. amm., N. solns., aqua amm.)

Spencer Chemical Co.
Dwight Bldg., Kansas City 5, Mo.
(anh. amm., N. solns., aqua amm.)

Southern Nitrogen Co.
PO Box 246, Savannah, Ga.

Standard Oil Co. (Indiana)
910 S. Michigan Ave., Chicago, 5
(anh. amm., N. solns.)

Texaco, Inc.
332 S. Michigan Ave., Chicago, 4
(anh. amm., N. solns., aqua amm.)

U. S. Industrial Chemicals Co.
99 Park Ave., N. Y., 16
(anh. amm., N. solns., aqua amm.)

SOLIDS — Prills, Powders, Granules

Alabama By-Products Corp.
PO Box 354, Birmingham, Ala.
(amm. sulfate)

American Cyanamid Co.
30 Rockefeller Plaza, N. Y., 20
(amm. sulfate, amm. nitrate, urea)

Armour Agricultural Chem. Co.
Atlanta, Ga.
(amm. nitrate)

Atkins, Kroll & Co.
417 Montgomery St., San Francisco
(urea, calcium nitrate)

H. J. Baker & Bro.
600 Fifth Av., N. Y., 20
(amm. sulfate, ca. amm. nitrate, tankage, DAP)

Bradley & Baker
155 E. 44th St., N. Y.
(Manufacturer's agents, importers of amm. sulfate, amm. nitrate, urea)

Commercial Solvents Corp.
260 Madison Ave., N. Y. 16
(amm. nitrate)

Escambia Chemical Corp.
exclusive distributor:
Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg., Atlanta
(amm. nitrate)

Ford Motor Co.
3001 Miller Rd., Dearborn, Mich.
DAP (21-53-0)

Grace Chemical Co.
Home Federal Bldg., Memphis
(urea)

Grand River Chem. Div., Deere & Co.
Pryor, Okla.
(urea)

Hercules Powder Co.
900 Market St., Wilmington 99, Del.
(urea)

Hydrocarbon Products Co.
500 Fifth Ave., New York 18

NITROGEN MATERIALS (Solids) (Contd.)

Interlake Iron Corp.
Union Commerce Bldg., Cleveland, 14
(amm. sulfate)

Intl. Commodities Corp.
11 Mercer St., New York 13
(urea, amm. nitrate)

Int. Ore & Fertilizer Corp.
500 Fifth Ave., New York 36

Koppers Co.
Pittsburgh 19
(amm. sulfate)

Lebanon Chemical Corp.
Lebanon, Pa.
(activated sludge)

Monsanto Chemical Co.
1700 S. 2nd St., St. Louis 24, Mo.
(amm. nitrate)

R. S. Mueller Co.
Garrett Bldg., Baltimore 2, Md.
(amm. sulfate)

Nitrogen Div., Allied Chem. Corp.
40 Rector St., New York, 6
(amm. sulfate, amm. nitrate, urea)

Nitrogen Products, Inc.
National Bank Bldg., New Brunswick, N. J.
(amm. sulfate)

Northern Chemical Industries, Inc.
Totman Bldg., Baltimore 2, Md.
(amm. sulfate, amm. nitrate)

Olin Mathieson Chemical Corp.
Plant Food Div.
Little Rock, Ark.
(amm. sulphate, amm. nitrate, urea)

Phillips Chemical Co.
Adams Bldg., Bartlesville, Okla.
(amm. sulfate, amm. nitrate)

Republic Steel Corp.
Republic Bldg., Cleveland, 1
(amm. sulfate)

Smith-Douglass Co., Inc.
5100 Virginia Beach Blvd., Norfolk, Va.
(tankage)

Sohio Chemical Co.
PO Box 628, Lima, O.
(urea, amm. nitrate)

Spencer Chemical Co.
Dwight Bldg., Kansas City 5, Mo.
(amm. nitrate)

Southern Nitrogen Co.
PO Box 246, Savannah, Ga.
(amm. nitrate, urea)

Southwest Potash Co.
1270 Ave. of The Americas,
New York, N. Y.
(potassium nitrate)

United Fertilizer Co.
Carrollville, Wisc.
(tankage)

United States Steel Corp.
525 William Penn Place, Pittsburgh 30
(amm. sulfate-granular)

U. S. Pipe & Foundry Co.
2300 First Ave. N., Birmingham 2, Ala.
(amm. sulfate)

Woodward & Dickerson, Inc.
1400 S. Penn Square, Philadelphia, 2
(Brokers—amm. sulfate, ammoniates, tankage)

NOZZLES — See Valves

PAILS; Steel — See also Drums

American Can Co.
100 Park Ave., N. Y.

Bennett Industries
122 Washington St., Peotone, Ill.

Central Can Co.
2415 W. 19th St., Chicago

Continental Can Co.
100 E. 42nd St., N. Y.

Eastern Can Co.
Keap St. & Kent Ave., Bklyn.

Fein's Tin Can Co.
Bush Terminal, Brooklyn

Gueder, Paeschke & Frey Co.
324 N. 15th St., Milwaukee

Inland Steel Container Co.
30 W. Monroe, Chicago

Jones & Laughlin Steel Corp.
3 Gateway Center, Pittsburgh

National Steel Barrel Co.
3860 E. 91st St., Cleveland

Rheem Mfg. Co.
1707 Edgar Rd. W., Linden, N. J.

Stern Can Co.
71 Locust St., Boston 25

U. S. Steel Prod. Div.
30 Rockefeller Plaza, New York 20

Vulcan Containers, Inc.
Bellwood, Ill.

Vulcan Steel Container Co.
3315 N. 35th Ave., Birmingham, Ala.

PAN FILTER

Dorr-Oliver, Inc.
Stamford, Conn.
(vacuum filter for phosphoric acid)

PARADICHLOROBENZENE

Columbia Southern Chemical Corp.
1 Gateway Center, Pittsburgh

Dow Chemical Co.
Midland, Mich.

E. I. du Pont de Nemours & Co.
Wilmington, Del.

Hooker Chemical Corp.
603 Buffalo Ave., Niagara Falls, N. Y.

Mallinckrodt Chemical Works
3600 Second St., St. Louis

Monsanto Chemical Co.
1700 S. Second St., St. Louis

Solvay Process Div., Allied Chem. Corp.
61 Broadway, New York 6

PHENOTHIAZINE

American Cyanamid Co.
30 Rockefeller Plaza, New York

American Firstoline Corp.
Sutphin Blvd., Jamaica 35, N. Y.

Atomic Basic Chemicals Corp.
PO Box 10855, Pittsburgh, Pa.

Chemo Puro Manufacturing Corp.
Doremus Ave., Newark 5, N. J.

E. I. du Pont de Nemours Co.
Wilmington, Del.

pH METERS

Analytical Measurements, Inc.
585 Main St., Chatham, N. J.

Beckman Instruments, Inc.
2500 Fullerton Ave., Fullerton 1, Calif.

PHOSPHATE MATERIALS (phosphate rock, triple superphosphate, superphosphate)

American Agricultural Chem. Co.
100 Church St., New York 7
(rock, super)

American Cyanamid Co.
30 Rockefeller Plaza, New York 20
(rock, triple super)

DI MON
(a modified di-ammoniumphosphate 18-46-0 granular)
Triple Superphosphate
Phosphoric Acid
U. S. Phosphoric Products
Tampa, Florida
See advertisement on pages 24, 25

PHOSPHATE ROCK
from 77% BPL to 72%
ground to order
screen analysis sample
sent before shipment
AMERICAN CYANAMID CO.
30 Rockefeller Plaza, N. Y.
See advertisement on Page 36

SUPERPHOSPATE
PHOSPHATE ROCK
Bone Products • Fluosilicates
Sulfuric Acid • Phosphoric Acid
Phosphates • Phosphorus
Phosphorus Compounds
AMERICAN AGRICULTURAL CHEMICAL CO.
100 Church St., New York 7, N. Y.
See advertisement on Page 9

FERTILIZER RAW MATERIALS

Phosphate rock, superphosphate, mixed fertilizers, potash, sulphur, nitrogenous fertilizers, mineral supplements, insecticides

International Ore & Fertilizer Corp.
500 Fifth Ave., New York 36
See advertisement on Page 15

DIAMMONIUM PHOSPHATE

21-53-0

100% Water Soluble

FORD MOTOR COMPANY
Steel Division
3001 Miller Rd., Dearborn, Mich.
See advertisement on Page 111

POTASH

60% Standard Muriate
60% Granular Muriate
60% Coarse Granular Muriate
Sulfate of Potash
Chemical Muriate 99.9% KCl

Potash Company of America
Carlsbad, New Mexico

See advertisement on Page 3

POTASH

- HiGrade Muriate (62-63%)
- HiGrade Granular Muriate (62-63%)
- Granular Muriate (60%)

U. S. BORAX
50 Rockefeller Plaza
New York 20

See advertisement on Page 7

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Keep handy on your desk, for daily reference.

AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

PHOSPHATE MATERIALS (Contd.)

Armour Agricultural Chem. Co.
Atlanta, Ga.
(rock, triple super)

H. J. Baker & Bro.
600 Fifth Avenue, New York 20
(phosphate, triple, DAP)

Bradley & Baker
155 E. 44th St., N. Y. 17
(triple, DAP)

Coronet Phosphate Co.,
Div. Smith Douglass Co., Inc.
Norfolk 1, Va.
(rock)

Davison Chemical Div.,
W. R. Grace & Co.
Baltimore 3, Md.
(super, triple super, rock)

Ford Motor Co.
3001 Miller Rd., Dearborn, Mich.
(DAP, 21-53-0)

Hooker Chemical Corp., Phosphorus Div.
Jeffersonville, Ind.
(phosphatic solutions)

Intl. Commodities Corp.
11 Mercer St., New York 13
(rock, triple, super)

Intl. Minerals & Chemical Corp.
Skokie, Ill.
(triple, super)

Intl. Ore & Fertilizer Corp.
500 Fifth Ave., New York 36
(super, rock)

Northern Chemical Industries, Inc.
210 E. Redwood St.
Baltimore 2, Md.
(super)

Olin Mathieson Chemical Corp.
Little Rock, Ark.
(super, conc. super, amm. phosphate)

Phillips Petroleum Co.
Bartlesville, Okla.
(triple super)

Planters Fertilizer & Phosphate Co.
Charleston Heights, S. C.
(super)

Smith-Douglass Co., Inc.
5100 Virginia Beach Blvd., Norfolk, Va.
(rock)

FERTILIZER RAW MATERIALS

Phosphate rock, superphosphate ammonium sulfate, potash, urea, ammonium nitrate, sulfur, ammonium phosphates, minor elements

complete fertilizer mixture to your order

International Commodities Corp.
11 Mercer St., New York 13, N. Y.
See advertisement on Page 6

Swift & Co.
Bartow, Fla.
(rock, triple super)

U. S. Phosphoric Products Div., Tennessee Corp.
Box 3296, Tampa 1, Fla.
(triple super, DAP)

Western Phosphates, Inc.
distributor:
Wilson & Geo. Meyer & Co.
San Francisco
(triple super)

PHOSPHORIC ACID

American Agricultural Chem. Co.
100 Church St., New York 7

American Cyanamid Co.
30 Rockefeller Center, New York

Bradley & Baker
155 E. 44 St., New York 17, N. Y.

Bunker Hill Co.
660 Market St., San Francisco 4

Food Machinery & Chem. Corp. Mineral Products Div.
161 E. 42rd St., New York 17

Hooker Chemical Corp., Phosphorus Div.
Jeffersonville, Ind.

Davison Chemical Div., W. R. Grace Co.
Baltimore 3, Md.

A. R. Maas Chemical Co.
Div. Victor Chemical Works
4750 Ardine St., South Gate, Calif.

Monsanto Chemical Co.
St. Louis, Mo.

Olin Mathieson Chemical Corp.
Little Rock, Ark.

Shea Chemical Corp.
P. O. Box 267, Marysville, Ohio

Tennessee Corp.
619 Grant Bldg., Atlanta

U. S. Industrial Chemicals Co.
99 Park Ave., New York 16

U. S. Phosphoric Products Div.
Tennessee Corp.
Box 3269, Tampa 1, Fla.

Victor Chemical Works
Div. of Stauffer Chemical Co.
155 N. Wacker Dr., Chicago 6

Western Phosphates Inc.
distributor:
Wilson & Geo. Meyer & Co.
San Francisco

PLANT GROWTH REGULATORS

Abbott Laboratories
14th and Sheridan Ave., N. Chicago
(Gibberellic Acid)

Eli Lilly & Co.
740 S. Alabama St., Indianapolis 6
(Gibberellic Acid)

Fine Organics Inc.
205 Main St., Lodi, N. J.
(Naphthaleneacetic Acid)

PLANT GROWTH REGULATORS (Contd.)

Heyden-Newport Chemical Corp.
342 Madison Ave., New York
(maleic hydrazide)

Merck & Co., Chemical Division
Rahway, N. J.
(Indole Butyric Acid, Gibberellic Acid)

Miller Products Co.
S.W. Caruthers St., Portland 1, Ore.
(Naphthalene Acetic Acid)

Miller Chemical & Fertilizer Corp.
2226 N. Howard St., Baltimore
(Naphthalene Acetic Acid)

S. B. Penick & Co.
4161 Beck Ave., St. Louis 16
(Gibberellic Acid)

Chas. Pfizer & Co.
630 Flushing Ave., Brooklyn 6
(Gibberellic Acid)

Texaco, Inc.
332 S. Michigan Ave., Chicago 4
(Naphthalene Acetic Acid)

U. S. Rubber Co., Naugatuck Div.
Naugatuck, Conn.
(Maleic Hydrazide, Phthalamic Acid)

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11
(Gibberellic Acid)

POTASH

American Potash & Chem. Corp.
3030 W. 6th St., Los Angeles, 54

Berkshire Chemicals Inc.
420 Lexington Ave., N. Y., 17
(Nitrate of Potash)

H. J. Baker and Bro.
500 5th Ave., New York, 20

Bonneville, Ltd.
Salt Lake City, Utah

Bradley & Baker
155 E. 44th St., New York

duVal Sulphur & Potash Co.
exclusive distributor:
Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg., Atlanta

French Potash & Import Co.
51 East 42nd SSt., New York 17

Intl. Commodities Corp.
11 Mercer St., New York 13

Intl. Ore & Fertilizer Corp.
500 5th Ave., New York, 36

Intl. Minerals & Chem. Corp.
Skokie, Ill.

Potash Import & Chemical Corp.
285 Madison Ave., New York 17

Southwest Potash Corp.
1270 6th Ave., New York, N. Y.

Potash Company of America
1625 Eye St., N.W., Washington, D. C.

U. S. Borax
50 Rockefeller Plaza, New York, 20

PRIVATE BRANDS — See Custom Packaging

PROTECTIVE CLOTHING — See Clothing

PULVERIZERS — See Mills

PUMPS

Aldrich Pump Co.
Pine St., Allentown, Pa.

Aurora Pump Div.
Aurora, Ill.

Buffalo Pumps
524 Broadway, Buffalo

Dean Hill Pump Co.
4020 E. 16th St., Indianapolis, Ind.

Dorr-Oliver, Inc.
Stamford, Conn.

Duriron Co.
425 N. Findley, Dayton, O.

Goulds Pumps, Inc.
Seneca Falls, N. Y.

Hypro Engineering Co.
700 39th Ave., N.E., Minneapolis, Minn.

Johnston Pump Co.
Pasadena, Calif.

Marine Products Co.,
515 Wycaste Ave., Detroit 14

Proportioneers, Inc.
Harris Ave., Providence, R. I.

Roper Co.
Kankakee, Ill.

Tryco Manufacturing Co.
Decatur, Ill.

Warren Pumps, Inc.
Warren, Mass.

Viking Pump Co.
Cedar Falls, Ia.

Worthington Corp.
Harrison, N. J.

PYRETHRUM — See Insecticides

REBUILT MACHINERY

Brill Equipment Co.
2401 Third Ave., N. Y. 51

Chemical & Process Machinery Corp.
52 Ninth St., Brooklyn 19

Consolidated Products Co.
64 Bloomfield St., Hoboken, N. J.

First Machinery Corp.
209 Tenth St., Brooklyn 15

R. Gelb & Sons, Inc.
Union, N. J.

Machinery & Equipment Corp.
293 Frelinghuysen Ave., Newark 5

Perry Equipment Corp.
1428 N. 6th St., Phila. 22

Stein Equipment Co.
107 Eighth St., Brooklyn 15

Union Standard Equipment Co.
318-322 Lafayette St., N. Y. 12

Granular, Specially Sized

POTASH

Trona's new granular assures a quality fertilizer uniform in particle size

AMERICAN POTASH & CHEMICAL CORP.
3000 W. 6th St., Los Angeles 54

See advertisement on Page 35

Agricultural Chemicals' staff has done its best to compile an accurate, useful Buyers' Guide. — Still errors and omissions are bound to occur. We shall greatly appreciate it if readers will let us have suggestions for changes needed before publication of the 1961-62 Buyers' Guide. Send to:

AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

POTASH

PHOSPHATES

(Coarse, Granular, ROP)

INTERNATIONAL MINERALS & CHEMICAL CORP.

Skokie, Ill.

See advertisement on Pages 106-107

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AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

Basic Plant Foods

POTASH
PHOSPHORUS
NITROGEN

sales agents

BRADLEY & BAKER
155 E. 44th St., New York City

See advertisement on 3rd cover

REFRACTORIES

Plibrico lined furnace maintains fertilizer output of 20 tons/hour

PLIBRICO COMPANY
1807 Kingsbury Chicago 14

See advertisement on Page 114

ESPESOL 5

pesticide solvent

SIGNAL OIL & GAS CO.
Houston Division
Box 5008 Houston 12, Tex.

See advertisement on Page 12

REFRACTORY PRODUCTS

Plibrico Co.
1807 Kingsbury, Chicago

REPELLENTS

Cowles Chemical Co.
7016 Euclid Ave., Cleveland 3
(Diethyl Toluamide)

Fairfield Chemicals Div., FMC
441 Lexington Ave., New York 17
(Crag)

Glenn Chemical Co.
2735 N. Ashland Ave., Chicago 14
(Tabatrex)

R. W. Greeff & Co.
10 Rockefeller Plaza, New York 20
(Diethyl Toluamide)

Hercules Powder Co.
900 Market St., Wilmington 99
(Diethyl Toluamide)

McLaughlin Gormley King Co.
1715 S.E. 5th St., Minneapolis
(MGK Repellent)

RESPIRATORS — See Masks

RODENTICIDES

Amchem Products Inc.
Ambler, Pa.
(Fumarin)

Hooker Chemical Corp.
Niagara Falls, N. Y.
(Zinc Phosphide)

Inland Chemical Corp.
415 Lexington Ave., New York

Motomco, Inc.
Terminal Ave., Clark, N. J.
(Pival, Pivalyn)

S. B. Penick & Co.
4161 Beck Ave., St. Louis 16
(Warfarin)

Prentiss Drug & Chemical Co.
101 West 31st St., New York 1
(Warfarin)

ROTENONE — See Insecticides

RYANIA — See Insecticides

SABADILLA — See Insecticides

SCALES — See also Bag Packing and Weighing Machinery

Atlanta Utility Works
Atlanta, Ga.

Allen Scale Co.
774 Murphy Ave., S. W., Atlanta 3

BIF Industries
536 Harris Ave., Providence, R. I.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Burrows Equipment Co.
1316-AC Sherman Ave., Evanston, Ill.
(Portable)

Exact Weight Scale Co.
941 West 5th Ave., Columbus 8

Richardson Scale Co.
668 Van Houten Ave., Clifton, N. J.

Thayer Scale & Engr. Corp.
Pembroke, Mass.

Toledo Scale Co.
Toledo, Ohio

Weighing and Controls
Industrial Park, Hatboro, Pa.

Winslow Governor Standard Scale Works, Inc.
Winslow & 25th St., Terre Haute, Ind.

SCREENING-SIFTING-CLASSIFYING EQUIPMENT

Atlanta Utility Works
East Point, Ga.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Cleveland Vibrators Co.
2828 Clinton St., Cleveland

Davidson Kennedy Co.
Box 97, Station D, Atlanta

Dorr-Oliver, Inc.
Stamford, Conn.

B. F. Gump Co.
1338 S. Cicero Ave., Chicago

Hewitt Robins Inc.
Stamford, Conn.

Inglett & Co.
P. O. Box 3425, Augusta, Ga.

Kennedy-Van Saun Mfg. & Eng'g Corp.
405 Park Ave., N. Y. 22

Ludlow Saylor Wire Cloth Co.
634 S. Newstead Ave., St. Louis, Mo.

Simplicity Engineering Co.
Durand, Mich.

Southwestern Engineering Co.
4800 Sante Fe Ave., Los Angeles 58

Stephens-Adamson Manfacturing Co.
Aurora, Ill.

Stedman Foundry & Machine Co.
Aurora, Ill.

Sturtevant Mill Co.
123 Clayton St., Boston, 22

W. S. Tyler Co.
3615 Superior St., Cleveland 14

Universal Vibrating Screen Co.
Racine, Wis.

Young Machinery Co.
Muncy, Pa.

SEED TREATMENTS — See Fungicides

SEPARATORS, Magnetic

Dings Magnetic Separator Co.
4711 W. Electric Av., Milwaukee 46

Eriez Mfg. Co.
Erie 6, Pa.

Magni-Power Co.
Wooster, Ohio

SODIUM MOLYBDATE — See Trace Elements

SOIL FUMIGANTS—See Nematocides

SOIL TESTING KITS

Edwards Laboratory
Norwalk, Ohio

LaMotte Chemical Products Co.
Chestertown, Md.

Steller Research Co.
Box 1071, Santa Cruz, Calif.

Sudbury Laboratory
S. Sudbury, Mass.

SOLVENTS (for insecticides)

Amoco Chemicals Corp.
910 S. Michigan Ave., Chicago 80
(Panasol)

Anderson-Prichard Oil Corp.
Liberty Bank Bldg., Oklahoma City 2, Okla.
(Stod-Sol, Apco solvent)

Cosden Petroleum Corp.
Big Spring, Tex.
(Xylene, Aromatic Solvents)

Crowley Tar Products Co.
271 Madison Ave., New York 16
(Xylol)

Delhi-Taylor Oil Corp.
Fidelity Union Tower, Dallas, Tex.

Esso Standard Oil Co.
15 West 51st St., New York 19

Neville Chemical Co.
Neville Island, Pittsburgh 25

SOLVENTS (for insecticides) (Contd.)

Penn Industrial Chem. Corp.
Clairton, Pa.

Penola Oil Co.
15 West 51st St., New York 19
(Penola HAN)

Richfield Oil Corp.
555 S. Flower St., Los Angeles 17
(Toxisol PX)

Signal Oil & Gas Co.,
Box 5008, Houston 12, Texas
(Espesol 5)

Sinclair Chemicals
600 Fifth Ave., New York

Skelly Oil Co.
605 W. 47th St., Kansas City 41
(Skellysolve)

L. Sonneborn Sons
300 Fourth Ave., New York 10

SPRAY NOZZLES — See Valves, Nozzles

SPREADERS-STICKERS — ADJUVANTS

Antara Chemicals Div.,
General Aniline & Film Corp.
435 Hudson St., New York 14

Armour & Co., Adhesives Div.
1355 W. 31st St., Chicago 9

Chipman Chemical Co.
Bound Brook, N. J.

Colloidal Products Corp.
11 Gate 5 Rd., Sausalito, Calif.

E. I. du Pont de Nemours & Co.
Wilmington, Del.

Florida Agricultural Supply Co.
P. O. Box 658, Jacksonville, Fla.

General Chemical Div.,
Allied Chemical Corp.
40 Rector St., New York 6
(Plyac)

Holloway-Sucro Chemicals Corp.
57-02 48th St., Maspeth 78, N. Y.

Marathon Corp.
Menasha, Wis.
(Marasperse)

National Aniline Div.,
Allied Chemical Corp.
40 Rector St., New York 6
(Nacconol)

Pennsalt Mfg. Co. of Washington
2901 Taylor Way, Tacoma, Wash.
(Penco Activator)

Rohm & Haas Co.
Washington Sq., Philadelphia 5
(Triton)

Stepan Chemical Co.
Edens & Winnetka, Northfield, Ill.

A. E. Staley Mfg. Co.
Decatur, Ill.
(Soybean Flour and Corn Starch)

Vanderbilt Co., R. T.
230 Park Ave., New York 17

Witco Chemical Co., Inc.
122 E. 42nd St., New York 17
(Emcols)

SULPHUR

Prompt
Molten
Sulphur
Deliveries

TEXAS GULF SULPHUR CO.
75 East 45th Street
New York 17, N. Y.

See advertisement on Page 118

STORAGE (including Silos)

Marietta Concrete Corp.
Marietta, O.

Edward S. Nelson Co.
Clarksdale, Miss.

National Tile Silo Co.
Livestock Exchange Bldg.
Kansas City, Mo.

SULPHUR

du Val Sulphur & Potash Co.
exclusive distributor:
Ashcraft Wilkinson Co.
Atlanta, Ga.

Flag Sulphur & Chemical Co.
P. O. Box 5437, Tampa 5, Fla.

Freeport Sulphur Co.
161 E. 42nd St., N. Y., 17

Gulf Sulphur Co.
Houston, Texas

Intl. Ore & Fertilizer Corp.
500 Fifth Ave., New York 36

Jefferson Lake Sulphur Co.
Whitney Bldg., New Orleans

Olin Mathieson Chemical Corp.
Baltimore 3, Md.

Pan American Sulphur Co.
609 Bank of the S.W. Bldg., Houston

Stauffer Chemical Co.
380 Madison Ave., N. Y. 17

Texas Gulf Sulphur Co.
75 East 45th St., N. Y. 17

Texas International Sulphur Co.
Houston, Tex.

SULFURIC ACID

American Agricultural Chem. Co.
100 Church St., New York 7

American Cyanamid Co.
30 Rockefeller Plaza, N. Y. 20

Dixon Chemicals
Paulsboro, N. J.

W. R. Grace Co., Davison Chemical Div.
Baltimore 3, Md.

Monsanto Chemical Co.
St. Louis 24, Mo.

Northern Chemical Industries
Totman Bldg., Baltimore 2, Md.

SULFURIC ACID

grades and strengths
from 60° Baume through
the various Oleums

TENNESSEE CORPORATION
612-629 Grant Building
Atlanta 3, Ga.

See advertisement on Page 90

Olin Mathieson Chemical Corp.
Little Rock, Ark.

Planters Fertilizer & Phosphate Co.
Charleston Heights, S. C.

Stauffer Chemical Co.
380 Madison Ave., N. Y. 17

Tennessee Corp.
617-29 Grant Bldg., Atlanta

U. S. Industrial Chemicals Co.
99 Park Ave., N. Y. 16

SURFACTANTS — See Wetting Agents

SYNERGISTS

Fairfield Chemicals Div., FMC
441 Lexington Ave., New York 17

McLaughlin Gormley King Co.
1715 S. E. 5th St., Minneapolis

S. B. Penick & Co.
4161 Beck Ave., St. Louis 16

Prentiss Drug & Chemical Co.
101 West 31st St., New York 1

TANKS

Abrasion & Corrosion Eng'g Co.
Amarillo, Tex.

J. B. Beaird Co., Inc.
Clinton, Iowa

Birmingham Tank Co.
Birmingham, Ala.

Butler Mfg. Co.
7312 E. 13th St., Kansas City, Mo.

R. D. Cole Manufacturing Co.
Newman, Ga.

Dallas Tank Co., Inc.
203 W. Commerce, Dallas 22, Texas

Flexi-Liner Co.
359 E. Main St., Decatur, Ill.
(laminated plastic liners to convert mild steel or wood tanks for storage of corrosive liquids)

Flint Steel Corp.
Box 3155, Memphis, Tenn.

Lubbock Machine & Supply Co.
P. O. Box 1589, Lubbock, Texas

Edward S. Nelson, Ltd.
Clarksdale, Miss.

Puget Sound Fabricators Inc.
3670 E. Marginal Way, Seattle 4, Wash.

FRITTED TRACE ELEMENTS
Six trace elements in fitted form
FERRO CORPORATION
4150 East 56 St., Cleveland 5, O.
See advertisement on Page 134

Michigan
TRACTOR SHOVEL
CLARK EQUIPMENT CO.
2463 Pipestone Road
Benton Harbor 6, Mich.
See advertisement on Page 110

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AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

TANKS (Contd.)

U. S. Rubber Co.,
10 Eagle St., Providence, R. I.
(flexible storage unit for liquid fertilizer)

Wendnagel & Co.
600 W. Cermak Rd., Chicago 16

TARPAULINS (for fumigation)

Hoosier Tarpaulin & Canvas Goods Co.
1302 W. Washington St., Indianapolis 6, Ind.

H. M. Sawyer & Son Co.
Stanley St., Watertown, Mass.

U. S. Rubber Co.
1230 Ave. of Americas, N. Y.

TESTING OF PESTICIDES (in the field)

Florida Field Trials
Box 356, Belle Glade, Fla.

Harris Laboratories
Lexington, Neb.

Trojan Laboratories
Box 353, San Lorenzo, Calif.

Dr. Wolf's Agricultural Labs.
2620 Taylor St., Hollywood, Fla.

TESTING — See Consultants

TRACE ELEMENTS (copper sulfate, zinc sulfate, manganous oxide, etc.)

Climax Molybdenum Co., Div. of American Metal Climax, Inc.
1270 Ave. of The Americas, N. Y. 20
(molybdenum)

American Limestone Co.
Knoxville, Tenn.
(zinc, magnesium, copper)

W. R. E. Andrews Co.
1505 Race St., Phila. 2
(copper, zinc, manganese)

Berkshire Chemicals Inc.
630 Third Ave., New York 17
(magnesium)

Crown Zellerbach Corp.
231 Sansome St., San Francisco
(iron)

Davies Nitrate Co.
118 Liberty St., N. Y. 6
(manganese, iron, copper, boron, zinc)

Eastman Chemical Products, Inc.
Kingsport, Pa.
(manganese)

Ferro Corporation, Agricultural Div.
4150 E. 56th St., Cleveland 5
(Fritted trace elements)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.

Glyco Products Co.
26 Court St., Brooklyn 2, N. Y.
(iron)

Intl. Commodities Corp.
11 Mercer St., New York 13

Intl. Ore & Fertilizer Corp.
500 Fifth Ave, New York 36

Nutrilite Products, Inc.
Buena Park, Calif.
(iron, zinc, manganese)

Phelps Dodge Refining Corp.
300 Park Ave., New York 22
(copper)

Tennessee Corp.
617-629 Grand Bldg., Atlanta, Ga.
(iron, copper, zinc, manganese)

U. S. Borax
50 Rockefeller Plaza, N. Y. 20
(boron)

TRACTOR SHOVELS

Clark Equipment Co.
2463 Pipestone Rd., Benton Harbor, Mich.

Frank G. Hough Co.
Libertyville, Ill.

Lessman Mfg. Co.
2005 Easton Blvd., Des Moines, Ia.

Yale & Towne Mfg. Co.
Philadelphia, Pa.

VALVES — NOZZLES

Bastian Blessing Co.
4201 W. Peterson Ave., Chicago 46

Bete Fog Nozzle Co.
Greenfield, Mass.

Dezurik Corp.
Sartell, Wisc.

Grinnell Co.
260 W. Exchange St., Providence, R. I.

Henry Valve Co.
3215 North Ave., Melrose Park, Ill.

Minneapolis Honeywell Regulator Co.
5800 N. 7th St., Philadelphia 44

Monarch Manufacturing Works, Inc.
3406 Miller St., Philadelphia 34

Spraying Systems Co.
3230 Randolph St., Bellwood, Ill.

Squibb Taylor Inc.
1213 S. Akard St., Dallas, Texas

VIBRATORS — See Conveyors, Feeders

WEED KILLERS — See Herbicides

WETTING AGENTS

American Cyanamid Co.
30 Rockefeller Plaza, New York 20

Antara Chemicals Div.,
General Aniline & Film Corp.
435 Hudson St., New York 14

Monsanto Chemical Co.
St. Louis 24

National Aniline Div.,
Allied Chemical Corp.
40 Rector St., New York 6

Stepan Chemical Co.
Edens & Winnetka, Northfield, Ill

Ultra Chemical Works
2 Wood St., Paterson 4, N. J.

Witco Chemical Co., Inc.
122 E. 42nd St., New York

WIRE CLOTH

Ludlow Saylor Wire Cloth So.
634 S. Newstead Ave., St. Louis, Mo.

W. S. Tyler Co.
3615 Superior St., Cleveland 14

APPLICATOR'S SECTION

AGRICULTURAL AIRCRAFT

American Airmotive Corp.
P. O. Box 187, Miami 48, Fla.
(NA-75 "composite" Stearman)

Auster Aircraft Ltd.
Rearsby, Leicester, England
(Workmaster, Agricola)

Bell Helicopter Corp. (helicopters)
P. O. Box 482, Fort Worth, Texas

CallAir, Inc. (A-5 & A-6)
Afton, Wyo.

Champion Aircraft (Aeronca, Sky-Trac)
Osceola, Wisc.

Clark Aircraft, Inc. (Ag-Biplane)
P. O. Box 903, Marshall, Texas

De Havilland Aircraft Co. Ltd.
Hatfield Aerodrome, Hatfield, Hertfordshire, England
(Chipmunk MK23)

Fletcher Aviation Corp. (FU-24)
Rosemead, Calif.

Grumman Aircraft Engineering Corp.
Bethpage, L. I., N. Y.
(Ag-Cat)

Hiller Helicopters (helicopters)
1350 Willow Road, Palo Alto, Calif.

Jackaroo Aircraft Ltd. (Jackaroo)
Thruxton Aerodrome, Andover, Hants, England

Kellett Aircraft Corp.
Box 35, Willow Grove, Pa.
(Cropmaster autogiro)

Michele Aircraft Corp. (Mike helicopter)
29 H. St., N. W., Washington 1, D. C.

Netherlandse Helicopter Industrie N. V.
Rotterdam Airport, Rotterdam, Holland
(Kolibrie H3 ramjet helicopter)

Piper Aircraft Corp. (Pawnee)
Lock Haven, Pa.

Rawdon Bros. Aircraft, Inc.
10412 E. Central Ave., Wichita, Kans.
(Rawdon T-1)

Republic Aviation Corp., Helicopter Div.
Farmingdale, L. I., N. Y.
(Alouette II helicopter)

Sikorsky Aviation Division, United Aircraft Corp. (helicopters)
Stratford, Conn.

Simpson & Whitney Aviation (Airplane)
Box 141, Liberal, Kans.

Snow Aeronautical Co. (Model S-2A)
Olney, Texas

Transland Aircraft (AG-2)
2600 West 247th St., Torrance, Calif.

AERIAL SPRAY EQUIPMENT

Accessories Mfg. Co. (spray nozzles)
922 Independence St., Kansas City, Mo.

AIRCRAFT EQUIPMENT

Complete line of dust-spray equipment. Swathmaster all-purpose applicating unit. Stearman hoppers: 165, 185 and 230 gal. capacities. Ag-2 agricultural airplane.

TRANSLAND AIRCRAFT
2600 W. 247th Street
Torrance, California

Bete Fog Nozzle Co. (spray nozzles)
309 Welles St., Greenfield, Mass.

Columbia Exporters (pumps)
730 S.E. 11th St., Portland, Ore.

Dakota Aviation Co.
Huron, S. D.
(Aero-Dyne spray tanks)

Harang Engineering
840 Lake St., San Bruno, Calif.
(cleaner for spray equipment)

Hawthorne Aircraft Industries
Valley View Ranch, Lucerne Valley, Calif.
(Stearman parts)

Nissen Aviation Products
1840 Emory St., San Jose, Calif.
(Span-flow spreader)

Fred W. Pickell & Associates
5707 York Blvd., Los Angeles 42, Calif.

Prairie Air, Inc.
P. O. Box 786, Clarksdale, Miss.
(Bartlebaugh combination spreaders)

Harold L. Root (pumps)
406 E. Walnut St., Visalia, Calif.

Root-Lowell Corp. (spray nozzles)
445 N. Lake Shore Dr., Chicago

Servo Engineering (hoppers)
Dos Palos, Calif.

Simplex Manufacturing Co.
5224 NE 42nd Ave., Portland 18, Ore.
(pumps, dump valves, spray booms)

Sorensen Aircraft (spray units)
Worthington, Minn.

Spray Engineering Co. (spray nozzles)
100 Cambridge St., Burlington, Mass.

Spraying Systems Co. (spray nozzles)
3230 Randolph St., Bellwood, Ill.

Transland Aircraft
2600 West 247th St., Torrance, Calif.
(Swathmaster combination spreader)

CHEMICALS for Aerial Application — See Insecticides, p. 67, 68; Fungicides, p. 64; Herbicides, p. 65

MISCELLANEOUS AIRCRAFT EQUIPMENT & SUPPLIES

Aeroquip Corp. (hose assemblies)
Jackson, Mich.

Agricultural Aviation Engineering Co.
858 Scott St., Santa Clara, Calif.
(components, systems, designs)

H. D. Campbell Co.
Farm Products Div., Rochelle, Ill.
(fertilizer concentrate solutions)

Clark Aircraft, Inc.
P. O. Box 903, Marshall, Texas
(metal wings & parts, Stearman)

Cooper Industries, Inc.
2149 W. Pratt Blvd., Elk Grove, Ill.
(Super Flite aircraft finishes)

Copon Associates (airplane paint)
P. O. Box 1113, Houston 1, Texas

Dresser-Ideco Co. (hangars)
875 Michigan Ave., Columbus 8, Ohio

Elmer's Wing Shop
P. O. Box 85, Waukena, Calif.
(wooden Stearman wings)

Eonair, Inc. (Eonite fabric covers)
Shafter Airport, Bakersfield, Calif.

H & M Agriflight High Lift Wing
Mesa Del Ray Airport, King City, Calif.
(metal-ribbed Stearman wings)

Motorola Communications & Electronics Inc. (two-way radios)
4501 W. Augusta Blvd., Chicago 51

Randolph Products Co.
12th St., Carlstadt, N. J.
(Butyrate finishes)

Ruleto Industries Inc.
4823 Rosecrans Ave., Hawthorne, Calif.
(metal Stearman wings)

Aircraft Finishes

Butyrate Finishes
Chromated Enamel

RANDOLPH PRODUCTS CO.
Carlstadt, N. J.

See advertisement on Page 93

MISCELLANEOUS AIRCRAFT EQUIPMENT (Contd.)

Ruth Street Aircraft Woodwork
Salinas Municipal Airport, Salinas, Calif.
(wooden Stearman wings)

Sky Store (goggles & helmets)
Hawthorne, Calif.

Vern's Wing Shop
Hiway 80, El Centro, Calif.
(wooden Stearman wings)

FERTILIZER APPLICATING EQUIPMENT

Adams & Doyle Equip. Mfg. Co.
Quincy, Ill.
(spreaders)

American Steel Dredge Co., Inc.
Fort Wayne, Ind.
(self-propelled liquid applicator)

Baughman Manufacturing Co.
236 Shipman Road, Jerseyville, Ill.
(blender-spreaders)

John Blue Co., Inc. (liquid applicators)
Huntsville, Ala.

Broyhill Co.
Dakota City, Nebr.

Campbell Mfg. Co.
Walthill, Nebra.

Century Engineering Corp.
401 Third St., S.E., Cedar Rapids, Iowa
(granule applicators)

Chowning Regulator Corp.
Corning, N. Y.
(pellet applicator)

Clark Manufacturing Co.
Atherton, Mo.
(liquid applicators)

John Deere (liquid & dry applicators)
Moline, Ill.

Dempster Mill Mfg. Co.
Beatrice, Nebr.
(liquid & dry applicators)

Fabricated Metals, Inc.
2400 Merced St., San Leandro, Calif.
(bulk application equipment and liquid applicators)

Farmhand Co. (manure spreaders)
Hopkins, Minn.

Finco, Inc. (liquid applicators)
Aurora, Ill.

Gandy Co. (spreader for granulars)
Box 269, Owatonna, Minn.

General Metals (liquid applicators)
P. O. Box 448, Greensboro, N. C.
(liquid applicators, spreaders)

Hahn, Inc. (liquid applicator)
2000 N. Sixth Ave., Evansville 7, Ind.

Highway Equipment Co.
698D Ave. N.W., Cedar Rapids, Iowa
(blender-spreaders)

Hercules Steel Products Corp.
Galion, Ohio
(spreaders)

New Leader L-32S

SPREADER

For accurate application of lime and fertilizer

HIGHWAY EQUIPMENT CO.
659 B Avenue, N. W.
Cedar Rapids, Ia.

See advertisement on Page 123

International Harvester Co.
180 N. Michigan Ave., Chicago 1
(liquid applicators)

KBH Corp. (NH_3 applicators)
Box 246, Clarksdale, Miss.

Pollard Mfg. Co. (liquid equipment)
Foshay Tower, Minneapolis, Minn.

Schelm Brothers, Inc.
201 Anna St., East Peoria, Ill.
(liquid applicators)

Simonsen Manufacturing Co.
Quimby, Iowa
(spreaders)

Southern States Cooperative
Seventh and Main Sts., Richmond 13, Va.
(blender-spreaders)

Standard Steel Mfg. Co., Inc.
2137 N. Sherman Drive, Indianapolis, Ind.
(spreaders)

Tryco Mfg. Co. (liquid applicators)
P. O. Box 1272, Decatur, Ill.

Welcome Mfg. Co. (NH_3 applicators)
Welcome, Minn.

INSECTICIDE APPLICATING EQUIPMENT

Acmeline Mfg. Co. (hand sprayers)
Traverse City, Mich.

American Steel Dredge Co., Inc.
Fort Wayne, Ind.
(self-propelled sprayers)

Arrow Products Co. (fumigators)
447 Lincoln St., Carlstadt, N. J.

B & G Company (sprayers)
Plumsteadville, Pa.

Banta Hi-Fog Co. (sprayers)
812 Truckway, Montebello, Calif.

John Bean Div., Food Machinery & Chemical Corp.
1305 S. Cedar St., Lansing 4, Mich.
(mist blowers, sprayers, granule applicators)

R. & E. Bertani (mist sprayers)
Abbiategrasso (Milan) Italy

Besler Corp. (aerosol insecticide sprayers)
4053 Harlan St., Emeryville, Oakland 8, Calif.

Broyhill Co. (sprayers)
Dakota City, Nebr.

Buffalo Turbine Agricultural Equipment Co.
70 Industrial St., Gowanda, N. Y.
(mist blowers, sprayers, dusters)

Campbell Bros. (mist blowers, sprayers)
30 Deerefield St., Greenfield, Mass.

Campbell Mfg. Co. (sprayers)
Walthill, Nebr.

Carter Insecticide & Chemical Co.
Box 209, Wallace, N. C.
(fumigation kits)

Century Engineering Corp.
401 Third St., SE, Cedar Rapids, Iowa
(granule applicators, sprayers, self-propelled equipt.)

Champion Sprayer Co. (sprayers)
6509 Heintz Ave., Detroit 11

R. E. Chapin Mfg. Co. (hand sprayers)
Batavia, N. Y.

Collins Feed & Supply Co.
Miami Shores 38, Fla.
(garden-type applicators)

Cooper, Pegler & Co. Ltd.
P. O. Box 9-307, Burgess Hill, Sussex, England
(mist blowers, dusters)

Cordox Corp. (mist blowers)
Bell Building, Chicago 1

Curtis Automotive Devices, Inc.
P. O. Box 323, Bedford, Ind.
(fogging devices)

Decker Mfg. Co. (sprayers)
Janesville, Wisc.

John Deere (granular applicator)
Moline, Ill.

Devenco Inc. (fog applicator)
150 Broadway, New York 38

Dobbins Div., Chamberlain Corp.
Waterloo, Iowa
(hand sprayers)

Dorman Sprayer Co., Ltd.
Ditton Walk, Cambridge, England
(knapsack sprayer & duster)

Ekholm Mfg. Co. (sprayers)
St. Paul 2, Minn.

Fabricated Metals, Inc.
2400 Merced St., San Leandro, Calif.
(fumigation equipment)

A. B. Farquhar Div., The Oliver Corp.
400 W. Madison St., Chicago 6
(mist blowers)

Fineco, Inc. (high-clearance sprayers)
Aurora 37, Ill.

Friend Manufacturing Co.
7 Prospect St., Gasport, N. Y.
(mist blowers)

Fumeral Co. (steam sprayers)
Racine, Wisc.

Gallo Co. (sprayers)
1312 Forest St., Racine, Wisc.

Gandy Co.
Box 269, Owatonna, Minn.
(granular chemical applicators)

Gard Industries, Inc. (sprayers)
1729 Harding Rd., Northfield, Ill.

Gustafson Mfg. Co. (soil fumigators)
Corpus Christi, Tex.

INSECTICIDE APPLICATING EQUIPMENT (Contd.)

Hahn, Inc. (high-clearance sprayers)
200 N. Sixth Ave., Evansville 7, Ind.

Hanson Equipment Co. (sprayers)
327 Charles St., Beloit, Wisc.

Hardie Manufacturing Co.
1825 W. Franklin St., Evansville, Ind.
(sprayers, mist blowers)

Homelite Corp. (mist blowers)
Port Chester, N. Y.

Howard Rotavator Co.
1600 E. Davis St., Chicago
(soil mixer)

Hub States Chemical & Equipment Co.
1255 N. Windsor St., Indianapolis, Ind.
(sprayers)

H. D. Hudson Manufacturing Co.
589 E. Illinois St., Chicago 11
(sprayers)

Insect Control Sales & Service
P. O. Box 152, Candor, N. C.
(soil fumigant applicators)

Jaeckh Mfg. Co. (hand sprayers)
Cincinnati

KBH Corp.
P.O. Box 246, Clarksdale, Miss.
(hi-clearance sprayers)

MacCarl Co. (hand sprayers)
4342 Pearl Rd., Cleveland

Mayrath Co. (sprayers)
Dodge City, Kans.

F. E. Myers & Bro. Co.
249 Orange St., Ashland, Ohio
(sprayers, mist blowers)

Niagara Chemical Div., Food Machinery & Chemical Corp.
100 Niagara St., Middleport, N. Y.
(liquid-dust applicators, mist blowers)

Nisto Gmbh. (electric aerosol sprayers)
Vienna, Austria

Noble Manufacturing Co.
Sac City, Iowa
(granular DDT applicators)

Oliver Corp. (sprayers)
400 W. Madison St., Chicago 6

Potts Feed Mill & Gin Co. (mist blowers)
Box 51, Crawford, Miss.

Robinson Fan Corp. (mist blowers)
Gilroy, Calif.

Root-Lowell Corp. (sprayers)
445 North Lake Shore Dr., Chicago 11

Schelm Bros. Inc. (sprayers)
201 Anna St., E. Peoria, Ill.

Scott Turbafog Co. (fogging machine)
Box 246, Auburn, Ind.

Silver Creek Precision Corp (sprayers)
Silver Creek, N. Y.

D. B. Smith & Co., (hand sprayers)
414 Main St., Utica, N. Y.

Southern Mill Creek Products Co.
P. O. Box 4297, Tampa, Fla.
(sprayers)

Standard Container, Inc.
Rockaway, N. J.
(hand sprayers)

Standard Steel Mfg. Co. (sprayers)
2137 N. Sherman Dr., Indianapolis 18, Ind.

Todd Shipyards Corp (sprayers)
81-16 45th Ave., Elmhurst, N. Y.

Tryco Mfg. Co. (sprayers)
P. O. Box 1272, Decatur, Ill.

Universal Metal Prods. Co.
Lowell, Mich.
(hand sprayers)

Victor Products Corp. (sprayers)
Ranson, W. Va.

Volume Spray Mfg. Co. (hand sprayers)
Tulsa, Okla.

Walsh Mfg. Co. (boom sprayers)
Charles City, Iowa

Z & W Mfg. Corp. (hand sprayers)
30240 Lakeland Blvd., Wickliffe, Ohio

MASKS and RESPIRATORS (See page 70)

MISCELLANEOUS GROUND EQUIPMENT

Acme Protection Equipment Co.
1201 Kalamazoo St., South Haven 6, Mich.
(face masks)

Allis-Chalmers (tractors)
Milwaukee 1, Wisc.

American Optical Co. (respirators)
Mechanics St., Southbridge, Mass.

Bete Fog Nozzle Co. (nozzles)
309 Welles St., Greenfield, Mass.

John Blue Co. (fertilizer pumps)
Huntsville, Ala.

Boettcher Supply Co.
Beloit, Kansas
(NH_3 applicator knife)

Broyhill Co. (lined tanks)
Dakota City, Nebr.

J. I. Case Co. (tractors)
700 State St., Racine, Wisc.

Caterpillar Tractor Co. (tractors)
Peoria, Ill.

Cooley Spray Equipment Works
Somers, Conn.
(spray discs, jet nozzles)

John Deere (tractors)
Moline, Ill.

Delavan Manufacturing Co.
West Des Moines, Iowa
(spray nozzles and accessories)

Deming Co. (liquid fertilizer pumps)
510 Broadway, Salem, Ohio

Dorr-Oliver, Inc. (rubber-lined pumps)
Stamford, Conn.

Fairbanks-Morse & Co. (pumps)
600 S. Michigan Ave., Chicago 5

Flexo Products, Inc. (dust masks)
Westlake, Ohio

Four Corner's Mfg.
5055 Crater Lake Hwy., Medford, Ore.
(NH_3 applicator knife)

General Metals Inc.
858 Goldsboro St., Greensboro, N. C.
(pressure & non-pressure tanks)

Gorman-Rupp Co. (pumps)
305 Bowman St., Mansfield, Ohio

Harang Engineering Co.
840 Lake St., San Bruno, Calif.
(cleaner for spray rigs)

Hardie Manufacturing Co. (pumps)
1825 W. Franklin St., Evansville, Ind.

H. D. Hudson Mfg. Co. (spray booms)
589 East Illinois St., Chicago 11

Hypro Engineering Inc. (fertilizer pumps)
709 39th Ave., N.E., Minneapolis 21, Minn.

International Harvester Co. (tractors)
180 N. Michigan Ave., Chicago 1

O. E. Linck Co.
Route 6, Valley Rd., Clifton, N. J.

Marine Products Co.
515 Lycaste, Detroit 14
(pumps)

Martindale Electric Co. (respirators)
1375 Hird Ave., Lakewood, Cleveland, Ohio

Massey-Ferguson Inc. (tractors)
Racine, Wisc.

Mine Safety Appliances Co.
201 N. Braddock Ave., Pittsburgh 8, Pa.
(respirators, gas masks, protective clothing)

Oliver Corp. (tractors)
400 W. Madison St., Chicago 6

Root-Lowell Corp. (spray nozzles)
445 N. Lake Shore Dr., Chicago

Schutte & Koerting Co. (nozzles)
Cornwells Heights, Bucks County, Pa.

Spray Engineering Co. (spray nozzles)
100 Cambridge St., Burlington, Mass.

Spraying Systems Co. (nozzles)
3230 Randolph St., Bellwood, Ill.

Stam's Mfg. Plant
114 N. 5th St., Watseka, Ill.
(NH_3 applicator knife)

Superior Steel & Malleable Castings Co.
700 Graham St., Benton Harbor, Mich.
(NH_3 applicator knife)

Tiura Mfg. & Sales
P. O. Box 1087, Patterson, Calif.
(applicator clamps & Shanks)

Taylor Machine Works
Louisville, Miss.
(NH_3 applicator knife)

Willson Products Div., Ray-O-Vac Co.
Second and Washington Sts., Reading, Pa.
(respirators)

Wisconsin Motor Corp.
Milwaukee 46, Wisc.
(engines for sprayers)

For Your Reference Library

The Following Publications are Available to Readers of Agricultural Chemicals

Handbook of Insecticide Dust Diluents and Carriers
A new and completely revised edition containing commercial information as well as research data on the subject. ..... $ 4.75

Handbook of Agricultural Pest Control—
S. F. Bailey and L. M. Smith
A comprehensive review of all phases of pest control including aerial application and tables and formulas. 3.25

Concentrated Spray Equipment, Mixtures and Application Methods—
A thorough and up-to-date coverage of this relatively new concept in the application of agricultural chemicals. 12.50

Advances in Pest Control Research (Metcalf) Vol. 1 ..... 14.50
Vol. 2 ..... 14.50

The Care & Feeding of Garden Plants 3.25
Chemical Insect Attractants & Repellents (Dethier) 6.75
Chemistry & Action of Insecticides (Shepard) 10.50
Chemistry of Plants (Miller) 5.75
Chemistry of the Pesticides (Frear) 10.00
Commercial Fertilizers, Their Sources & Use (Collings) 9.50
Cotton Growing Problems (Christide's & Harrison) 12.00
Destructive & Useful Insects, Their Habits & Control (Metcalf & Flint) 13.75
Diseases of the Fruit Crops (Anderson) 9.50
DDT and Newer Persistent Insecticides (West, Campbell) 8.75
Hunger Signs in Crops 4.75
Insect Control by Chemicals (Brown) 15.25
Insect Resistance in Crop Plants (Painter) 9.80
Organic Insecticides (Metcalf) 10.00
Pathology in Forest Practice (Baxter) 7.75
Pesticide Handbook (Frear) 1.75
Pesticides (E. R. de Ong) 9.00
Plant Regulators in Agriculture (Tukey) 6.75
Principles of Fungicidal Action (Horsfall) 6.75
Scientific Principles of Crop Protection (Martin) 12.75
Soils & Fertilizer (Bear) 6.75
Soil Plant Relationships (Black) 7.25
Soils & Soil Fertility (Thompson) 7.25
Vegetable Crops (Thompson-Kelly) 9.00
Weed Control (Robbins, Crafts & Raynor) 8.75

Send check with order to
AGRICULTURAL CHEMICALS
P. O. Box 31, Caldwell, N. J.

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 10

CASH IN ON THE TREND TO N

Put More N in N-P-K

Tests show that high-nitrogen fertilizers produce big yields.

The stage is set for greater profits in manufacturing and selling mixed fertilizers. Farm crop needs, experiment station recommendations and fertilizer plant experience all point the way—to more N in N-P-K!

Farmers and crop experts alike agree that practically all of our leading crops need more nitrogen than any other plant food. And on a majority of soils, a high-nitrogen mixed fertilizer can supply all the plant foods needed in one trip across the field. Sales figures show that most of the tonnage of mixed fertilizer sold is lower in nitrogen than the needs of the crops on which the fertilizer is used. And, though side-dressing nitrogen has increased fast, even this additional nitrogen has not brought the total volume of nitrogen into balanced ratio with other plant foods.

Habits Can Change

On the other hand, progressive farmers everywhere have been accepting the 2-1-1, 3-2-2 and 1-1-1 ratio fertilizers as fast as manufacturers have made them available. For speed and ease of application, they have changed to 16-8-8 instead of 10-5-5; 13-13-13 instead of 6-6-6; and other higher-analysis mixtures in place of fertilizers having the same ratio but lower plant food content. When 15-10-10, 12-6-6, 16-4-8, 12-12-12, 15-15-15 and other high-nitrogen, high-analysis fertilizers have been offered, they have met with demand among leading farmers.

Some of these leading farmers have been ahead

(continued on following page)

(continued from preceding page)

of the colleges and industry in demanding these better and more concentrated fertilizers made in the proper ratio to meet crop needs. But now the wheel has turned. Most states are now recommending these 2-1-1, 3-2-2 and 1-1-1 ratio fertilizers in concentrated form. Thousands of field and plot tests by experiment stations, farmers and dealers have shown that these new fertilizers help farmers make more money with less work.

The situation looks complicated, but is basically simple. Farmers who used to apply 100 or 200 pounds of fertilizer per acre have found that it pays to use 400, 500 or even 1,000 pounds of the same analysis per acre. Their logical next step has been to find that this same large amount of plant food in more concentrated fertilizer pays even better. It saves the farmer labor, freight, time and cash.

Wake Up the Laggards

Now that the leaders have accepted and proved the value of high-nitrogen, high-analysis mixed fertilizers, this is the ideal time to sell other farmers on the same practical method of getting higher yields and profits. It pays to tell 'em in every way you can.

More N—More Profit

Obviously, this calls for greater production of high-nitrogen, concentrated mixed fertilizers. And, there is money in this for you. You save many ways, and you profit many ways, by producing high-N fertilizers.

1. By selling more nitrogen in mixed fertilizer you can get more profit per pound of nitrogen sold.
2. You get more of the total fertilizer market by selling more N in N-P-K.
3. You cut your costs other ways—less freight, less storage, less handling, fewer items to inventory per unit of dollar sales.
4. You get greater dollar volume through your plant producing high-nitrogen mixed fertilizers.
5. You keep ahead of your customers—and improve your reputation for supplying fertilizers that make money for farmers—because every bag supplies what the crops need.

Yes, the year ahead is a good time to take advantage of the growing enthusiasm for more N in N-P-K. Don't get behind your customers in the high-N parade—get your customers behind you. Start now to put more N in N-P-K and *More Money in Making Fertilizer!*

KEEP SALESMEN *PRODUCING* DURING THE OFF-SEASON

Fertilizer manufacturers have been known to remark that the industry would be better off if all salesmen were "off the road" between seasons. During such periods, farmers and dealers are usually more interested in beating down prices than in placing orders. They talk convincingly—and usually with exaggeration—about the "deals offered by competition." All too often salesmen, over-anxious to move material, end up by being induced to undermine their own price structure!

The moral is clear. Don't let your salesmen and dealers become mere "listening posts" in the off-season. Tell them to avoid entering into premature price negotiations with accounts that are merely "window shopping."

Take Positive Action

The best way to handle the chronic off-season problem is to plan to keep your salesmen and dealers busy with constructive activity during fall and winter months. Here's a list of off-season projects. Check this list for ideas. You may be surprised at how much you can do to make slack time more profitable.

OFF-SEASON PROJECTS FOR PROFIT

- ☐ Document testimonials, photos and yield response to last season's fertilizer application for use in future sales promotion.
- ☐ Design and install dealer identification signs and decals.
- ☐ Do some customer entertaining where it is necessary to get better acquainted or show appreciation to a big account.
- ☐ Survey your weak spots with an eye toward new prospects.
- ☐ Build good-will with agricultural officials and people in related fields who can influence fertilizer use.
- ☐ Review transportation methods for ways to improve service and cut costs.
- ☐ Promote needed application equipment in your market areas.
- ☐ Look for specialized applications which might offer an untapped market for your products.
- ☐ Correct and build up mailing lists.
- ☐ Plan next season's advertising program and the best methods for getting dealers to tie in.
- ☐ Hold meetings and field days with farmers and dealers.
- ☐ Organize your soil testing program.
- ☐ Conduct training sessions on selling techniques for your salesmen.
- ☐ Plan to introduce new high-nitrogen grades which mean more profit for you and better results for your customers.

Do Your Men Know How To Handle Your Equipment?

Getting plant personnel to operate and maintain equipment efficiently and economically is a serious problem to many fertilizer manufacturers. Ignorant and reckless handling of equipment can cause low output, costly break-downs, expensive repairs and production delays.

When one leading fertilizer manufacturer discovered that this condition was increasing his overhead and reducing his profits, he decided to do something about it. He called on a Nitrogen Division technical service man for assistance. Working together, they found a practical way to solve the problem.

Investigation showed that the men who worked with the equipment every day simply did not know enough about it to handle it properly. They needed training in operation and upkeep.

Operation and Maintenance Clinic

To obtain this training quickly and economically, it was decided to hold a clinic to be attended by key personnel from the fertilizer manufacturer's plants and invited representatives of the companies that made the equipment used in the plants.

Prior to the conference, the fertilizer men canvassed their co-workers and developed a list of pertinent questions. The equipment manufacturers came prepared to answer the questions and to demonstrate proper operation and maintenance. During the clinic, the men had full view of the equipment discussed and were able to disassemble various parts for clearer understanding.

For the fertilizer manufacturer, the result of the two-day clinic has been bigger production, lower overhead and better profits through a marked improvement in the use and the upkeep of the equipment in his plants. For the equipment manufacturers, the clinic was an opportunity to build better customer relations and to learn more about the problems that arise in actual use of the equipment they make and sell.

SOIL TESTS *NOW* CAN BE SALES-MAKERS FOR YOU

The biggest service you can perform for most of your farmer customers right now is to encourage them to test their soils. Help them to get the real facts on the plant foods their soils need to produce profitable crops and you're on sound ground to build bigger sales and customer satisfaction.

Soil tests show what the land needs. Lime, phosphorus, potash and organic matter or nitrogen levels are all important to the success of the next crop. When a farmer gets a soil test report, he's taken his first big step in planning a practical fertilizer program. And he is a hot prospect for some of the specific fertilizers you stock.

A soil test helps you get down to cases fast in selling. And when your dealers promote soil tests in the fall, you get a chance to sell fall fertilizers as well as spring fertilizers. Surveys in many areas show that farmers who use soil tests are way ahead of their neighbors in amount of fertilizer used.

Test Often

Some farmers run a soil test every third or fourth or fifth year. But when they change their rotation or crop plan, or feel the need to change their production goals to aim for higher yields, an immediate soil test is important. It takes the guesswork out of planning how to make more fertilizer produce more profit. Compared to the old shotgun approach of using the handiest, or cheapest, fertilizer mixture, the soil test is the rifle that enables farmers to shoot accurately for high yields. And farmers who continue to make money become loyal customers.

Dealer Promotion

Several systems of getting soil samples work well for dealers: (1) The farmer collects samples following directions of extension service or dealer. (2) The salesman collects soil samples. This works best if the farmer goes along. (3) The dealer hires a man to take samples, as agreed to previously by the farmer. (4) Special soil test drives, with extension service, dealers, and vo-ag or 4-H members cooperating, get a large percentage of fields tested for an area.

When the dealer pays for farm soil tests, he can automatically get a copy of the test report, and can easily help the farmer analyze his fertilizer needs. Many farmers, especially those new to soil testing, like to have someone consult with them on soil test recommendations appearing on the report. This also enables the dealer to point out that average recommendations may not be high enough for the most profitable yields. The proper proportion of plant foods, with larger quantities per acre, are often the better money-maker.

Plan a soil test program now. It's the top opportunity of the season to get new customers and to make old customers bigger buyers of your fertilizer.

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	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
DURANA*									
DURANA is a trade-mark of Allied Chemical Corporation.	37.0	13.3	53.4	15.9	9.4	7.2	1.235	0	36
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

*DURANA contains 8% formaldehyde.

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AG CHEM

Fertilizer Views and News

by Vincent Sauchelli

Dr. Sauchelli is a Consultant to the Agricultural Chemicals Industry.

Let's Have Simplicity

"IN science oversimplification has become a professional sin."

Perhaps. And yet there are times and occasions when scientific caution can justifiably be ignored if the end result is good. The complexity of the numerous factors involved is often bewildering. The pressure is on the scientist however to give a simple, forthright answer. Should he yield or not? Sometimes, in the interest of getting something done, the lesser of two evils is to give a simple, straightforward opinion. The temptation to *oversimplify,* however, is indulged in too often and by too many research workers. The sentiment in the beginning sentence above regarding oversimplification is quoted from a recent journal editorial. I share its sentiment. Why, is explained in what follows:

Grades of fertilizers

The fertilizer industry is based on the theory, first announced by Liebig in 1840, that plants are nourished by minerals available in porary with Liebig had also pubthe soil. Many others interested in this problem prior to or contemlished their investigations. But these other workers faiied to convince. The virtue of Liebig's contribution was its simplicity. It appeared plausible. He was wrong about nitrogen but his forthright, simple statement of how plants feed won acceptance, and later research abundantly established the general correctness of his views. Here was a case of an outstanding scientist who did not express his ideas as being tentative, so typical of our cautious contemporary scientists, but who dared to oversimplify to serve his purpose.

Time has marched on, and what has become of Liebig's simple views? A bewildering multiplicity of fertilizer grades has been engendered to satisfy what Liebig had envisaged as the simple mineral requirements of plant life. In some states, formulations of fertilizer grades are quite complicated. They contain the major, secondary, and minor mineral nutrients, auxins and pesticides. Our plea is for simplicity. For scientists to sin professionally by recommending a return to simple grades would be forgiven at least by a harassed number of agronomists, extension workers and, I daresay, many industrial personnel.

Nitrogen solutions

Why do we have so many nitrogen solutions? This question has been asked many times by purchasing agents and fertilizer operating personnel. In the beginning the industry was offered about a dozen solutions; at present, the number exceeds fifty, and confusion has been greatly compounded. Here, also, we plead strongly for simplicity. Many undoubtedly would gladly forgive those, who can speak authoritatively, even if they sinned professionally, by recommending simplification.

Soil testing

In the not-so-distant past, it was usual for agronomists and horticulturists to recommend a fertilization program for individual farms or for local areas based on their professional experiences, observations and knowledge of good local farm practices. Then, cautiously at first but bolder in time, the soil tester entered the scene. His techniques were expounded before astonished farmers who, like the rest of us, more or less conditioned by 20th century research marvels, have come to regard science as a sacred cow. The simplicity of the soil test technique, and the plausible arguments in support of the practice clinched its general acceptance. So it is that agronomists and fertilizer service personnel today would hardly dare make a fertilizer recommendation without the results of a soil test.

Most farmers want it. It is undoubtedly a good tool to use as a guide for making a fertilizer recommendation. I would go so far as to say it is indispensable. But it has serious limitations. The results of a soil test as generally practiced are far from being accurate or complete. The soil test does not tell us what the soil structure is, nor what are the moisture retentive properties of the soil, nor the interplay of cations and anions as it affects the microbial life of the root zone and the uptake of the essential plant nutrients. The chemical extractants used in the test have to be correlated carefully with long-time fertilizer-crop investigations. The

(*Continued on Page* 133)

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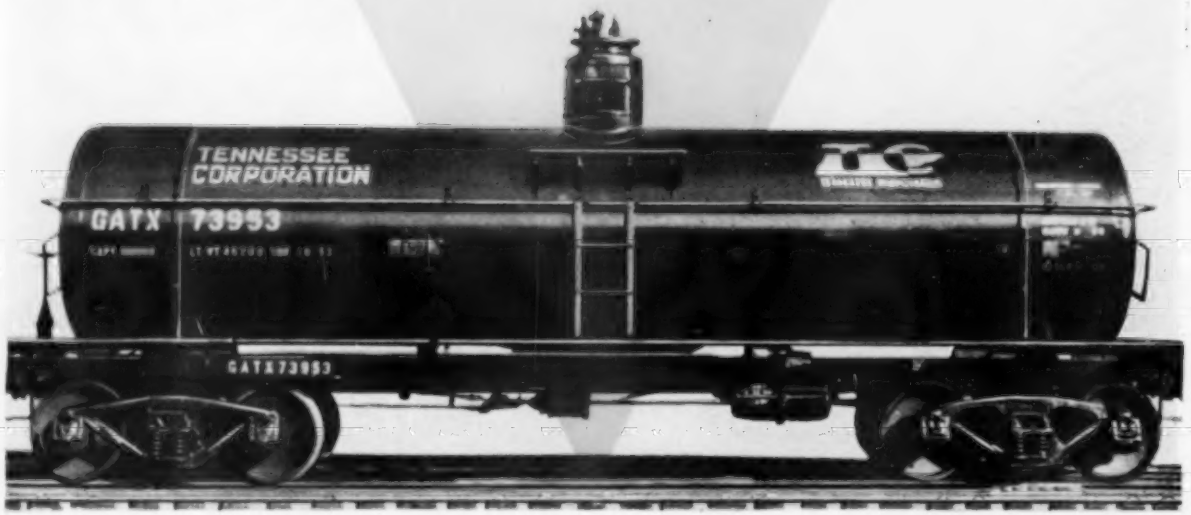
The AGRICULTURAL Applicator

• Although aerial application has attained a high state of effectiveness and efficiency with currently-available equipment, continuing research into flight techniques offers hope for further improvements. **Story on page 91.**

Top photo shows the Curtiss-Wright vertaplane rising vertically in a test flight. Bottom photo shows the Bell Air Scooter.

SULFURIC ACID



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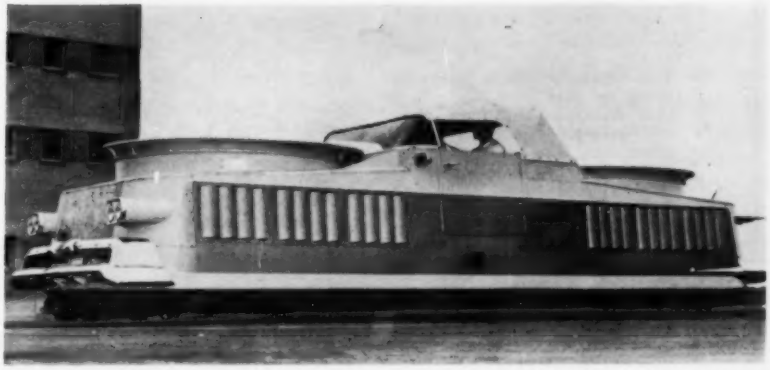
What's Ahead For Aerial Applicators?

The increasing interest in new methods of flight, although seemingly not of immediate benefit to agricultural aviation, bear close watching by aerial applicators for possible fringe benefits that might result.



The Curtiss-Wright air car, shown above, was one of the first ground effect machines. Such craft offer the potential for large load-carrying capacity with a small expenditure of horsepower. They also have the advantage of being able to travel over sea, marsh, snow, ice, or any level terrain.

FOLLOWING a post-war period (1945 to 1950), when agricultural aviation realized its most rapid growth, and the stabilization period of the last decade, when application techniques and methods were developed to their present high state, the aerial application industry can look forward to revolutionary advances in the future as a result of the increasing research being conducted in all phases of flight.

New flight techniques, such as vertical take-off planes and ground effect machines, are being developed by virtually every manufacturer of air craft, both in the United States and elsewhere. In addition, the armed services of the United States, in cooperation with various university research centers, carry on a continuing program of basic research into flying techniques and equipment.

One of the projects being viewed with interest by many application firms is the ground effect, or air car, type of vehicle. Two prime movers in this vein are Bell Helicopter Corp., Fort Worth, Texas, and Curtiss-Wright Corp., Wood-Ridge, N. J.

The Curtiss-Wright prototype travels on a cushion of low pressure, low velocity air at a height of from six to twelve inches, and can travel equally well over land, water, swamps, or mud. The first production model, an "air-car," is 21 feet long, eight feet wide, and weighs approximately 2,800 pounds with four passengers and a full gasoline load. Suspension of the air-car is accomplished through the maintenance of approximately 1/10 lb. pressure per square inch under the vehicle, augmented by a deflection membrane. The low pressure, low velocity air also is used for propulsion, and is capable of propelling the vehicle in any direction. Propulsion air also is used for braking.

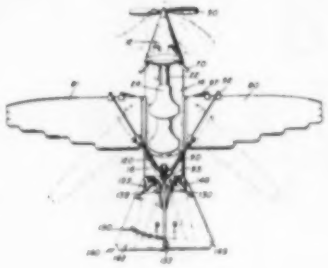
The Curtiss-Wright air-car can be built in a variety of forms, shapes, and heights. An example of the possibilties of the air-car is that a vehicle having the ground area of approximately that of a Volkswagen would be capable of supporting a 200 lb. load with a 65 horsepower engine. A vehicle the area of a standard U. S. limousine would weigh approximately 1,500 pounds and would be capable of supporting 700 lbs. payload, using 300 horsepower.

Bell Helicopter Corp., in an effort to gain insight into the operational problems of a ground effects machine, has developed the Bell Air Scooter, a machine 30 inches high, 53 inches wide, 85 inches long, and weighing 160 pounds. A 12-horsepower, 2-cylinder motorscooter engine, using a gasoline and oil mixture for fuel, turns a fan of 30 inches diameter, and the resulting air blast lifts the vehicle about two and one-half inches off the ground.

Presently, the propulsion system in the air scooter is being evaluated in regards to acceleration, forward speed, and hill climbing capability. Also being considered is obstacle clearance, an important consideration for agricultural applicators. The problem of obstacle clearance is more pronounced, the smaller the machine. The air scooter, therefore, is an ideal device on which to test various schemes for passing over obstacles.

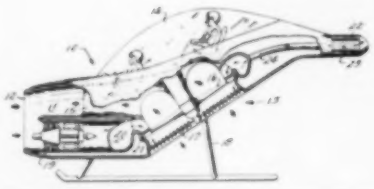
A good indication that the air cushion vehicle may be useful as

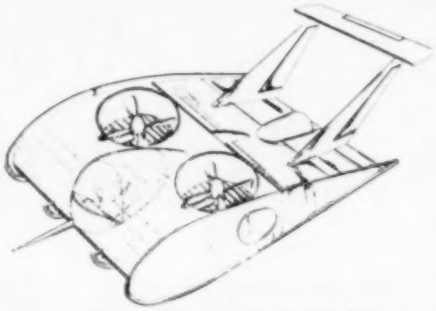
A sampling of new aircraft types that may be of benefit to agriculture.



The flying motor scooter, above, is convertible for both air and land use and could be used to conveniently check obstructions and boundaries on a field to be sprayed.

The aircraft design at right features a large fuselage that could conceivably carry a good deal of spray material. The down-draft created by the horizontal propellers would force insecticide down into plant rows for effective coverage.





The VTOL aircraft at left features a load-carrying fuselage with an air duct extending longitudinally through the fuselage. Outlet ducts are directed to the rear and down, which could be of benefit to applicators in that spray material might be discharged through the downward outlet.

a crop duster is that a major operational problem of the machines is dust, stirred up by the fan.

At the present stage of the development of this new type of vehicle, the low hover height tends to restrict its value as means of applying pesticides to growing crops. The hover height now is limited to a fraction of the vehicle's width but Bell has designed a series of vehicles which would travel at heights of one to two feet and tests indicate the possibility of achieving a hover height of seven feet.

Another Curtiss-Wright development which probably will be of more immediate interest to aerial applicators, is a vertical take-off plane. The company's test airplane, utilizing two new radial lift propellers, rose vertically in its first test to an altitude of 5,000 feet. At this altitude, transition was made to horizontal flight at 165 miles per hour. Testing of the propellers is continuing and the company is completing the fabrication of a six-place executive plane which will use four of the radial lift propellers. Smaller versions of the plane would solve many of the problems that arise when runways are located far from the fields that are being treated by air.

An important innovation that can be expected to speed the development of vertical take-off aircraft was announced last month by Princeton University's James Forrestal Research Center. Employing a specially designed 760-foot shed and a mechanical arm, Princeton scientists can test models of aircraft under virtually free-flight conditions. The new facility "is of the utmost importance in the development of vertical take-off aircraft," according to Dr. Alexander A. Nikolsky, director of the project and professor of aeronautical engineering at Princeton University. It is the closest scientists have come to the goal of free followed flight, Dr. Nikolsky said.

Dr. Nikolsky believes the new technique will become "widely accepted for studying the flying characteristics of proposed new designs."

Scale models of aircraft are flown the length of the shed. The mechanical arm, although attached to the model aircraft, does not exert any force to slow or distort the craft's free flight. Whenever the model moves in any direction, that movement is immediately sensed by an electronic device that commands the arm to follow the motion of the model, thus canceling any possible pull.

The new technique is far cheaper and safer than making trial runs with full-scale piloted aircraft, Dr. Nikolsky said. The new facility was constructed under the auspices of both the Transportation Corps of the Army and the Air Branch of the Office of Naval Research. The project currently is supported by the Army's Transportation Research Command. The first nonoperational aircraft that will be tested at the research center, by the way, is a saucer-like ground effect aircraft that is now in the research stage.

Among other interesting developments in aerial spraying is a pilotless English spraying aircraft that recently was patented in the United States. The airplane is guided by radio signals which control its course and release the spray material at the proper times. A remote-control device in the airplane switches the controls between a course-control mechanism that puts the aircraft on the swath run and a second course-control mechanism that holds it on course until the run is completed, at which time the first mechanism takes over to line up the aircraft for the next swath run.

A wide variety of other developments in flight, ranging from

(*Continued on Page* 141)

New Leader Distributor

Happel and Sons, Inc., Cedar Rapids, Iowa, has been appointed as a distributor for Highway Equipment Co. of Cedar Rapids, Iowa. They handle the New Leader lime spreaders, combination lime and fertilizer spreaders, and mobile blenders.

•

Roto-Werl Spreader

Hatfield Roto-Werl Spreader Corp., Hatfield, Pa., is offering an "agricultural model" of its spreader. Similar to the company's original model in appearance and operation, the agricultural model has been increased to almost four feet in height.

The unit's effective coverage is up to 35 feet, depending on the density of the material being spread, and its 8 foot hopper carries up to 1,500 pounds. A folder describing the device in detail is available from the company.

•

Spreader Body Brochure

Baughman Manufacturing Co., Jerseyville, Ill., is offering a brochure that contains information on its K-5 series of lime and fertilizer spreader bodies.

Air Applicators Sued

The Salinas Lettuce Farmers Cooperative has filed a $6,204 suit for damages against Rowland F. Henry and Robert Rider, operators of the Henry Crop Dusters, King City, Calif., and A. L. Castle, Inc., suppliers of an insecticide that allegedly was applied to a celery crop instead of a field of potatoes.

The complaint claims that Ed and Henry Pozzi contracted for dusting of a potato crop but the insecticide was applied to a field of celery through negligent operations. The $6,204 damages asked cover costs of shipping the celery by the Pozzis. The celery later was destroyed as contaminated.

•

Chuck Sellers Killed

Chuck Sellers of Sellers Aviation was killed last month while flying an agricultural airplane in the Edison area southeast of Bakersfield, Calif. Mr. Sellers was the son of Joseph Sellers, developer of the Sellers Swathmaster.

APPLICATOR MEETINGS

Oct. 10-11—Four-State Aerial Applicators Conf., Hotel Chinook, Yakima, Wash.

Nov. 10-13—Texas Aerial Applicators Association, annual convention, Echo Motor Hotel, Edinburg, Texas.

Dec. 6-8—National Aviation Trades Association, annual convention, Oklahoma Biltmore Hotel, Oklahoma City, Okla.

Jan. 5-7—California Aerial Applicators Association, annual convention, El Dorado Hotel, Sacramento, Calif.

Jan. 12-13—Arizona Aerial Applicators Association, annual meeting, The Wigwam, Litchfield Park, Ariz.

Jan. 19-21—Mississippi Aerial Applicators Association, annual convention, Buena Vista Hotel, Biloxi, Miss.

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AG CHEM PEST ROUNDUP

by Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U. S.

Oriental Fruit Fly Found In California Citrus Grove

THE oriental fruit fly, one of the most severe insect pests of citrus as well as a number of other hosts, was taken for the first time in the continental United States at Anaheim, California. A single female fly was taken in a trap in a citrus grove in the southeastern section of Anaheim during the week of July 24-29. Positive identification was made August 9. Plans were immediately initiated to intensively trap the area in the vicinity of the find. No further flies were found until August 31, when one male was trapped near Anaheim City Park, which is west of the original find.

General Insect Conditions

Grasshoppers, which during the early part of the season had caused very little damage, were rather noticeable in several states in August. Early in the month, populations were heavy in spots in Taos and Torrance counties, New Mexico, and threatening infestations occurred on 45,000 acres of rangeland and 62,000 acres of cropland in Quay County. Controls were necessary on 3,700 acres in Slope, Golden Valley, and McKenzie Counties, North Dakota. Grasshoppers also caused damage in localized areas of Minnesota, Wisconsin, Indiana, Ohio, Oklahoma, Arkansas, and Texas.

The fall armyworm caused serious damage in several states during August. Light to heavy defoliation of Bermuda grass, millet, grain sorghum, and lawns was general throughout Georgia. The insect caused serious damage to forage crops, pastures, and grain sorghum in the central and southern areas of Alabama. Heavy populations were recorded throughout Louisiana, with counts as high as 600 larvae per foot of row of grain sorghum in Tensas Parish.

Moderate to heavy infestations of the fall armyworm were found in fence rows of cropland and soil bank land in several central and north central Texas counties. Populations were heavier than usual in areas of northwest Arkansas, with the possibility of controls becoming necessary. The insect also damaged crops in areas of Oklahoma, Missouri, North Carolina, Illinois, and Arizona.

The average number of first-generation European corn borers per 100 plants, found during a survey in Illinois, was 8.80 compared with 4.32 in 1959. In Boone County, Iowa, larvae averaged 8 per 100 corn plants, as compared with 7 for the same time in 1959. The second brood was expected to be considerably larger in 1960 than in 1959. Corn plantings in areas of Cass County, North Dakota, showed infestations of or near 100 per cent. The borer was quite heavy on corn in the southeastern, east central, and south central areas of South Dakota, but no control had been applied. It was expected that the insect would be heavier in New Jersey than it had been for some time.

The pea aphid was the heaviest in many years on second cutting alfalfa and alfalfa grown for seed in areas of Yakima and Adams Counties, Washington. Populations were becoming very abundant in alfalfa and red clover in southwest Idaho. Treatment was necessary in many fields. Counts of 20,000-30,000 pea aphids per 100 sweeps were recorded in Montrose and Garfield Counties, Colorado. In New Castle County, Delaware, the aphid was on the increase with counts of 250-300 per sweep.

Heavy populations of the spotted alfalfa aphid were occurring over Antelope Valley, Los Angeles County, California, by late August. The insect was also heavy on first year alfalfa stubble in areas of Sacramento County. Populations were building up in areas of Colorado and many alfalfa fields in Chaves and Eddy Counties, New Mexico, were heavily infested. Although infestations were low by late August in Yuma County and in most central and southeast Arizona area alfalfa fields, damage during the July buildup was heavy in many sections, with 50-70 per cent loss common in fields planted to susceptible varieties.

The boll weevil, which was reported last month as being on the increase, continued that trend during August. Heavy rains, early in the month, upset treatment schedules in North Carolina to such

(*Continued on Page* 134)

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AG CHEM LISTENING POST

by Paul Miller

This department, which reviews current plant disease problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Epidemiology Investigations, Crops Protection Research Branch, USDA, Beltsville, Md.

Fungicide Exhibits Protectant and Eradicant Properties

BIS-(3,4-Dichloro-2 (5)-Furanonyl) Ether, a promising new nonmercurial fungicide exhibits both protectant and eradicant properties. Avery E. Rich (6), of the New Hampshire Agricultural Experiment Station, describes the physical and chemical properties of this compound, which is refered to as mucochloric anhydride. It is the active ingredient in organic nonmercurial fungicides developed by the General Chemical Division of Allied Chemical Corporation in cooperation with the New Hampshire Agricultural Experiment Station, under the code number GC-2466.

The material gave good results in both preinfection and postinfection control of apple scab (*Venturia inaequalis*) in greenhouse and field tests in which it was compared with other organics. It also was effective against tomato late blight (*Phytophthora infestans*) in the greenhouse, and tomato and potato early blight (*Alternaria solani*) in greenhouse and field trials. It was slightly phytotoxic to tomato plants in the early blight field trials. It also was phytotoxic to pears and to potato seed pieces when tested for use as a seed-treatment fungicide.

According to Rich, the preliminary tests indicated a slight systemic action. He concluded that the material showed much fungicidal promise and that it should be given further trial.

Pink Root Of Onions

Pink root (*Pyrenochaeta terrestries*) is one of the serious diseases of onions and shallots in Louisiana, acording to M. M. Kulik and E. C. Tims (1), of Louisiana State University. Control measures have not given good results. In the hope of finding an effective chemical, Kulik and Tims screened 54 fungicides, including many newly released experimental chemicals, and 29 chemotherapeutants.

For laboratory testing, they adapted the filter paper disc method developed for antibiotic potency assays, since the agar plate method ordinarily employed for fungicide screening was too slow for use with the pink root fungus. Two filter paper discs that had been soaked in water, or in a solution or suspension of one of the test chemicals, and then dried, were placed on top of inoculated agar in Petri plates. Two plates were used for each treatment. The plates were incubated for 36 hours and then the zone in which growth of the fungus was inhibited around each chemically treated disc was measured. Kulik and Tims found that the zone of inhibition varied directly with the magnitude of the inhibitory effect of the chemical tested. However, they noted that, in particular cases, lack of inhibition might be due to inability of the test chemical to diffuse through the agar.

By this method, Kulik and Tims tested 54 fungicides and 29 chemotherapeutants at a concentration of 1000 parts per million. Statistically, the inhibitory effect of 25 of the fungicides and 8 of the chemotherapeutants was highly significant, and that of 2 additional fungicides was significant. Effects of other chemicals tested were not statistically significant.

For greenhouse screening tests, Kulik and Tims treated pots of inoculated sand with drenches of the test chemicals at 1000 parts per million and planted seed of a pink-root susceptible onion variety immediately afterward. Incidence of pink root, rated at the end of the experiment, was reduced to 1% or less by 22 of the 50 fungicides tested in the greenhouse experiments. None of the 28 chemotherapeutants resulted in this much reduction in disease.

Twenty of the 22 effective fungicides were retested in sand cultures at 200 parts per million. At this low concentration, 9 of the 20 reduced incidence of pink root to 1% or less. Only 3 of the 20, however, produced significant inhibition of growth of the pink root fungus at 200 parts per million, when tested in the laboratory by the modified filter paper disc method.

Promising Decay Inhibitors

About 3000 fungicides have been tested since 1946 for inhibition of postharvest decay of citrus fruit, according to J. J. Smoot, G. A. Meckstroth, and C. F. Melvin (4), of the Market Quality Research Division, Agricultural Mar-

keting Service, United States Department of Agriculture. Not many were effective against stem-end rot (*Diplodia natalensis* and *Phomopsis citri*) or green mold (*Penicillium digitatum*), the major postharvest decays of Florida citrus fruit.

Of the compounds that gave best results, Smoot and his coworkers tried out 124 on a larger scale. Of these intensively tested fungicides, 20 were considered to be most promising. In one or more tests, each of the 20 materials reduced total decay by at least 75% after 2 weeks storage at 70°F and caused no more than slight to moderate chemical injury to the fruit. Eleven of the 20 selected compounds were carbanilic acid derivatives.

Some of the test fruit was treated for 12 to 72 hours with ethylene to degreen it, as in commercial practice, before the fungicides were applied. In general, more decay developed in the ethylene-treated fruit. Two explanations were suggested: the 1- to 3-day delay, at warm temperatures, between harvest and fungicide treatment; and stimulation of growth of *Diplodia natalensis* by ethylene.

The 10 compounds that still were available from the manufacturers during the 1958-59 season were retested. Results obtained from the test chemical were compared with those obtained from sodium orthophenylphenate plus hexamine, the standard recommended treatment for citrus postharvest decay. Three compounds (carbalinic acid, *m*-chloro-, isopropyl ester; hydracrylonitrile, carbanilate; and 2-propyn-l-ol, carbanilate) were consistently more effective than the standard treatment; three (carbanilic acid, l-methoxy-, 2-propyl ester; carbanilic acid, 2-methoxy-, propyl ester; and 8-quinolinol condensation product) were more effective than the standard treatment in the fall tests but gave poorer results on midseason fruit tested in winter; and the other four (8-quinolinol sulfate; thioacetamide; urea-boric acid reaction product (1 boric acid to 1 urea); and urea-boric acid reaction product (2 boric acid to 1 urea)) were not so effective as the standard treatment. Chemical injury was not commercially important and there was no apparent increase in amount of physiological rind breakdown from treatment with any of these 10 compounds.

Because of their limited solubility in water, the three most effective compounds had to be dissolved in ethanol for the tests. The cost of ethanol or other organic solvents would preclude commercial use of these chemicals. Two of them were successfully formulated in water-wax emulsions. Applied in this form, hydracrylonitrile, carbanilate reduced decay by 92% after 2 weeks and 77% after 3 weeks storage, and 2-propyn-l-ol, carbanilate by 100% after 2 weeks and 91% after 3 weeks. Comparable figures for sodium orthophenylphenate plus hexamine in a water-wax emulsion were 74% and 21%. None of the treatments resulted in chemical injury or increased rind breakdown.

Smoot and his coworkers concluded with the caution that the compounds discussed by them cannot be recomended for use on fruits or vegetables at present, since toxicity to warm-blooded animals has not been determined and residue tolerances have not been established by the Food and Drug Administration, Department of Health, Education, and Welfare.

Nematode Control

Ralph E. Motsinger and O. D. Morgan (2), of the University of Maryland, obtained excellent control of root knot (*Meloidogyne* sp.) and of aphids (*Myzus* sp.) from applications of a 5% granular formulation of 0,0-diethyl 0-2 pyrazinyl phosphorothioate at 10 and 20 pounds per acre to tobacco soil in crocks. Four different application times, from 2 weeks before to 10 days after planting, were compared in the tests. Rate or time of treatment did not affect results, all treated plants remaining free from both nematodes and aphids after treatment.

In previous trials, some stunting and the appearance of small spots on lower leaves of treated plants indicated that the material was systemic. However, the affected plants soon recovered and caught up with untreated plants in growth.

Effectiveness of the systemic property for aphid control was studied by allowing populations of the insects to build up on the plants. After 6 weeks the insects were found only on untreated plants.

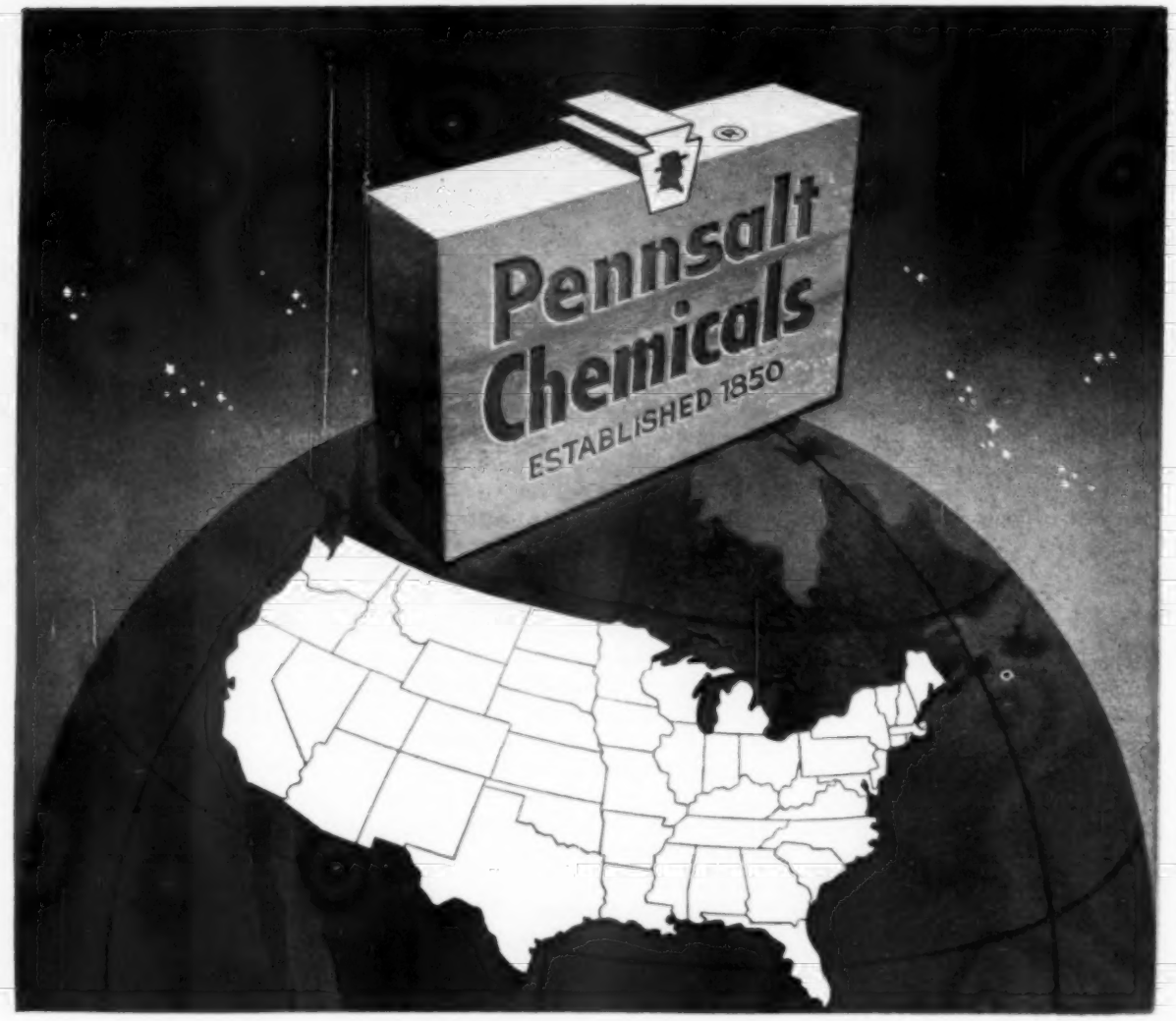
Hawthorn Leaf Blight

Forrest C. Strong (5), of the Michigan Agricultural Experiment Station, reports results of 3 years of trials of cycloheximide used at low concentrations to control hawthorn leaf blight (*Entomosporium theumenii*). The disease is especially troublesome on Paul's Scarlet, a pink-flowered variety of the English Hawthorn, which is regularly defoliated by from mid-August to mid-September every year.

The cycloheximide used in the experiments was a wafer preparation (Acti-spray). From 1952 to 1958 it was used at the concentration of 20 parts per million, applied 3 times at 10-day intervals beginning in early July. Very good control resulted, even when the first application was made as late as the middle of July. According to Strong, young leaves in the spring suffer severe injury from as low as 5 parts per million of cycloheximide, but no injury was observed from the higher concentration applied in the summer.

Tests with reduced concentrations of cycloheximide were started in 1957. Five parts per million proved to be as effective as 20 parts per million for protecting foliage from infection during the 3 years of tests. Paul's Scarlet trees varying in age from 5 to 20 years were sprayed 3 times at 2-week intervals

(*Continued on Page* 135)



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WASHINGTON REPORT

by Donald Lerch

WHILE no one has said much about this publicly, the U. S. Department of Agriculture will face a tough fight for funds in the next Congress. This is expected no matter who wins in November.

Congressmen are beginning to attack USDA appropriations in the belief that agriculture is declining in the U. S. Critical Congressmen claim they cannot justify to themselves or to their constituents the kind of budgets USDA has been getting. They point out that since 1952 USDA personnel has gone up from 67,000 to 86,000, while 700,000 families have moved out of farming and agricultural population has dropped 3,000,000. How can Congress justify present appropriations to aid agriculture, members of Congress ask themselves, when demands are growing for more schools, more federal aid for the aged, more foreign aid, and so on?

This is actually a serious situation. Cuts in USDA budgets not only would cut back agricultural research, vital to agricultural chemicals, but also downgrade the prestige of the Secretary of Agriculture in the Cabinet.

What some farm leaders here suggest is that a broad effort be made to put USDA's functions today into better public focus by creating a better image of agriculture. USDA is in reality a Department of Food and Nutrition whose work is of vital importance to everyone who eats. That means everybody. The farmers are an essential part of food production, but they are only a part.

Unless something is done to convince the city and suburban taxpayers that their money is being well spent through USDA, we're going to see a serious drop in influence and in service of this vital function of our government.

* * * * *

Interior Secretary Fred Seaton, who is one man in Washington who knows that pesticides are an essential part of effective conservation practices, has recently promised a new program which may mean more sales for insecticides, herbicides, and fertilizer.

For several years the Interior Department has been running a "MISSION 66." Its aim has been to improve the National Park System for their millions upon millions of visitors. Next year, Secretary Seaton predicts that Interior will launch a "MISSION 76." It will be a program whereby the Federal Government gives technical assistance and grants for the establishment and rehabilitation of local, state, and regional recreational and park areas.

No one has to look far to see how insect control, brush and weed removal, and turf and tree fertilization can fit into this program in hundreds of locations. As we've reported before, outdoor recreation is the wave of the future, and it will get another big boost next year when the President's National Outdoor Recreational Resources Review Commission make its first report.

Agricultural chemicals leaders now probing this development are not overlooking the public relations benefits, either. The public is going to love the people who help to give them the recreational facilities they want.

* * * * *

This may be highbrow theory, but nutritionists from all over the nation are deeply concerned about the race between science and technology and population growth. Talking with leading nutritionists here in Washington convinces us that the men and women most concerned with feeding the people believe that hunger—rather than the cold war or even nuclear annihilation — is mankind's biggest threat today. Their concern is more with enlarging food sources than with other aspects of nutrition.

Dr. James Bonner, of California Institute of Technology, says that, "Rapid population growth has and will lead to poverty, hunger, and misery for millions of human beings." Some of the more world-wise nutritionists add this startling challenge. They claim that social and economic programs which hold back technological advances pose the biggest problems of all. To this every agricultural chemicals executive could offer a sincere "amen."

Public relations men and humanitarians here see this world's growing hunger as a real opportunity for pesticide manufacturers to chalk up some gold and silver stars in public opinion, just by showing how the expanded use of

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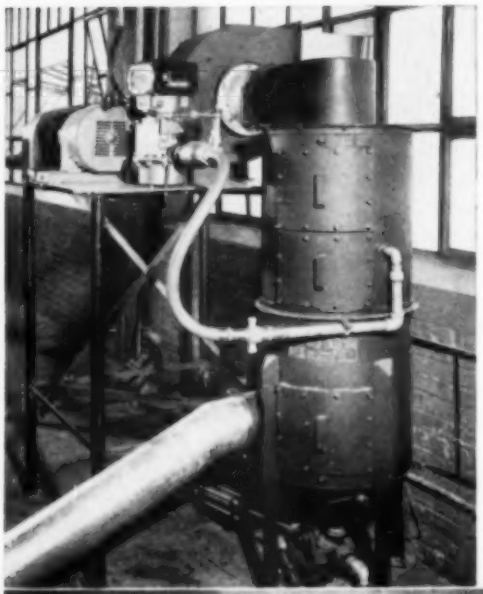

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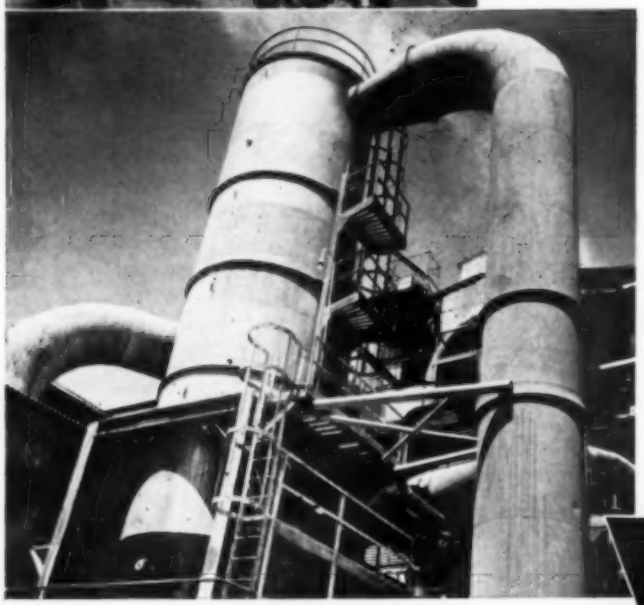

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- Pharmaceuticals—Exhaust from mold dryers, etc.
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* * * * *

Just a few days before the NAC's annual meeting in California, Executive Secretary Lea S. Hitchner made a powerful statement of the industry's views to a committee appointed by California's Governor Brown to investigate pesticide residues.

Three main points were made which will be heard often under similar circumstances in the future. They are: 1) we are plunging into a scientific age in which few citizens are qualified to judge the value or the safety of scientifically discovered practices, 2) the public will have to depend upon guidance from state and national leaders on scientific questions, and 3) if this guidance is to be in the balanced best interests of all the people, the guidance should come from panels of scientific experts who know all the scientific and economic factors involved.

The real power of Hitchner's statement is that it applies to all scientific advances to benefit the public, and which may be opposed for one reason or another by special interest groups. It's our job as citizens to cooperate in building public confidence in this means of settling scientific disputes and providing guidance to the mass of non-scientifically trained public.

* * * * *

Wildlife enthusiasts, who have made a fad of criticizing the use of pesticides on the claim that pesticides injure wildlife, have been taken aback by a report on the automobile's toll of birds and small animals. In a recent report covering some 14,000 miles of highways in Western New York State checked in 1959, 316 dead birds and small animals were observed, or an average of 2.2 dead birds or animals per mile of highway traveled.

The truth appears to be that we live in a world which offers many hazards. Our job, as pesticide industry and farm leaders have long pointed out, is to minimize the hazards and maximize the benefits so that what we do works to the balanced best interests of all the people.

* * * * *

Pesticide industry leaders here are pleased at the positive public attitude food marketers are starting to take toward the use of chemicals in food production and processing.

The National Agricultural Chemicals Association as well as the food groups such as the American Meat Institute are distributing copies of the proceedings of the 23rd Super Market Institute. The proceedings contain these notable quotes:

Dr. Charles Glen King, Executive Director, The Nutrition Foundation, Inc.—"No nation in history has had a food supply that would compare with our present supply in terms of nutritive value, safety, convenience, stability, variety, attractiveness, and availability."

Also, Dr. King: "What makes the 'Delaney clause' impractical and unworkable is its absolutism. There is a real danger that legal and arbitrary restrictions will not permit our citizens to use reason and judgment in the essential task of producing and consuming the best food supply in the world."

Dr. Herrell DeGraff, Professor of Food Economics, Graduate School of Nutrition, Cornell University: "We are living in a chemical age. We can answer none of the problems that such an age generates by anything so simple as eliminating chemicals. If we were to take that approach, we would soon be short of food."

Dr. Frederick J. Stare, chairman, Department of Nutrition, Harvard School of Public Health: "As a physician and student of nutrition for the last 25 years, I should like to state categorically that I do not know, nor have I ever heard, of a single case of ill health in man that has been shown to have been due to the addition of approved additional chemicals to foods. And I say additional chemicals because I wish to emphasize again that all foods and nutrients are composed of chemicals."

* * * * *

Manufacturers whose product uses are covered by the Food Additives Amendment of 1958 are facing a final deadline of March 6, 1961, under the bill. William H. Goodrich, Assistant General Counsel for the Food and Drug Administration, has told small groups of people here that "food additives that have not been proven safe will become food adulterants" after the March 6 cut off date.

Goodrich is advising people who believe their products are safe, but have not yet been able to convince FDA, to start work now on food additive petitions. In FDA's view, there is little or no chance that Congress will extend the deadline beyond March 6.

* * * * *

Our congratulations to Clarence M. Ferguson, able Administrator of the Federal Extension Service, on moving up to Assistant Secretary of Agriculture. He succeeds Ervin L. Peterson who has become executive secretary of the Milk Industry Foundation located here. In his new position, Assistant Secretary Ferguson will be in overall charge of Agricultural Research, USDA's regulatory programs, the Forest Service, and conservation as well as Extension.

* * * * *

With an eye to fears of growing timber shortages, the National Plant Food Institute has put out a practically-illustrated pocket-size booklet on "How To Fertilize Trees and Measure Response." NPFI spokesmen say this is a pioneering effort. At least the 67-page work covers all the basic data.

As this column has reported many times before, forestry is developing into a major market not only for fertilizers, but for all kinds of pesticides as well. Aerial applicators have a big stake in this growing market, too. The only economical way to apply either fertilizer or pesticides in large forest areas is by plane.★★

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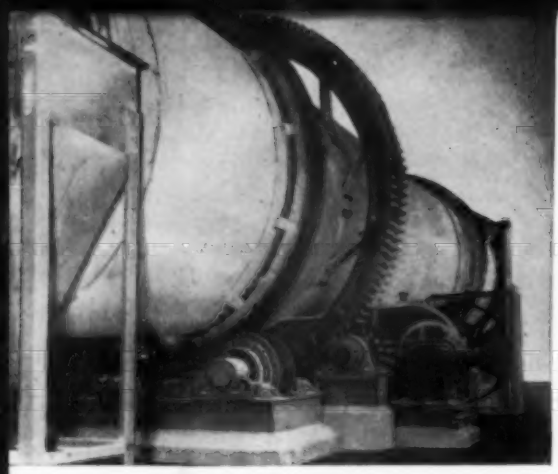

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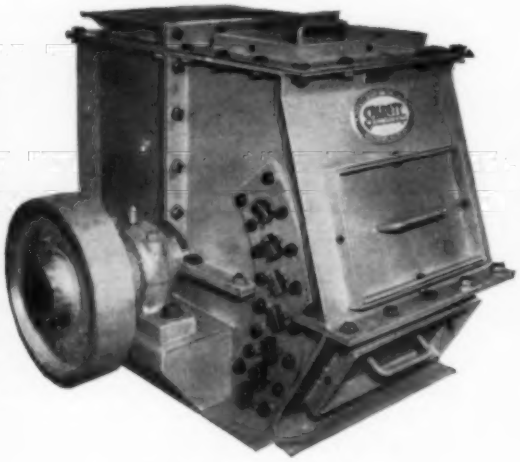

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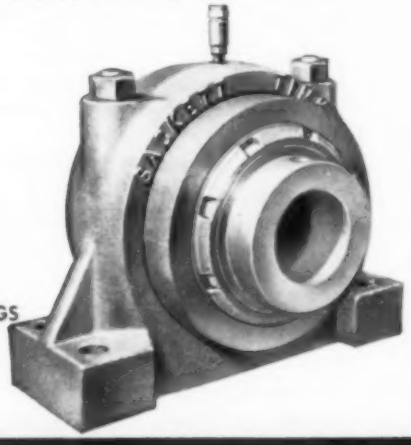

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PRODUCTION ROUND TABLE

Evaluating Efficiency In A Fertilizer Plant

SEVERAL technical tools are available to the fertilizer manufacturer to allow him to determine the efficiency of his plant,—to evaluate the quality and uniformity of the final product,—and to check the progress of fertilizer production at any intermediate phase. These tools may be classified as chemical analysis and physical data. But uppermost is intelligent use of *information*, which can be obtained from: research, articles in trade magazines, literature supplied by sales personnel, "product use prospectus" copy in trade advertisements, and last but not least, through personal contact with the technical staffs of producers of fertilizer raw materials.

In analyzing the value of the information available, the following questions should be reviewed:

1. Are the conclusions based on concrete facts, and are they reliable and reproducible?
2. Is sufficient data available for your use?
3. What is the background and experience of the author preparing the data?
4. Can present plant layout be adapted to use the information, and provide similar results?
5. Are the economics presented inclusive and sound?

Evaluating Chemical Data

In fertilizer manufacture, determinations of moisture, nitrogen, phosphate and potash are critical in setting production controls.

Moisture content determines the physical condition of a pulverized fertilizer. In a granulated fertilizer, moisture content has a limiting effect on granule size. In plant production, moisture data will reflect losses in the production process, and also give an indication of possible shrinkage showing up in the final product analysis. The method of determining moisture will establish whether free water and/or crystal water are present in the product or intermediate products. It would be desirable for the industry to follow a standard method of moisture analysis,—but even more critical and essential is uniformity within the plant. The same method of moisture determination should be used in a plant to check moisture on: a) raw materials, b) final product, and c) materials in process.

The total nitrogen value is an indication of the absorption capacity of the formula. A shortage of nitrogen in the final product, as compared with the input of nitrogen materials, is an indication of nitrogen loss in the process. A determination of ammonia nitrogen is helpful in evaluating the absorption capacity of the phosphate in the formulation. In this determination (of ammonia nitrogen), it should be remembered that the total may be reduced by that amount which has combined with the nitrate ion and the sulfate ion (if ammonium sulfate is included in the formula).

Phosphate analysis offers many aids in determining the progress of a process. The total phosphate indicates the maximum amount of "available phosphate." Water soluble phosphate is an indication of the extent of the ammoniation reaction;—while insoluble phosphate will show any effect of over-ammoniation, reversion due to excess heat or the presence of too much water and heat.

A useful index in fertilizer processing is the Ammonia/Available Phosphate ratio. This ratio is fairly constant for most grades of superphosphate, and of particular interest to the manufacturer trying to use maximum amounts of ammoniating solutions with minimum nitrogen loss. After establishing the ammonia-available phosphate ratio for a particular type of phosphate, the manufacturer is able to make more stable use of ammoniating solutions.

Physical Characteristics of Fertilizer

Physical characteristics of fertilizer are important for several reasons. The customer, for one, tends to judge a fertilizer by its "handleability" in the field. The fertilizer producer, on the other hand, is concerned with its flowability, dustiness, and particularly any changes occurring during storing or shipping.

The particle size of a raw material or finished material is usually analyzed using a nest of screens and machine to give uniform shaking (Ro-Tap in common use). Particle size is important not only from an appearance standpoint,—but because it is a measure of drillability and handleability of of a fertilizer. Determination of

(*Continued on Page* 133)

NEWS ABOUT THE TRADE

Montrose In 3-Way Merger

Negotiations toward a three-way merger of Montrose Chemical Co. and Baldwin Rubber Co. into Centlivre Brewing Corp. were announced last month. The surviving company will be known as Baldwin-Montrose Chemical Co.

Current negotiations contemplate the issuance of convertible preferred stock of the surviving company in exchange for the common stocks of Baldwin and Montrose. Montrose is a producer of DDT and DDVP insecticides which are distributed by R. W. Greeff & Co., New York.

•

Heptachlor Mix Warning

North Carolina farmers and fertilizer manufacturers were warned last month by State Agriculture Commissioner L. Y. Ballantine that the "sale of fertilizer-heptachlor mixtures is illegal and farmers who buy it may find themselves sharing the penalty for violation."

Mr. Ballantine said that his office had received reports that farmers had urged their supplier to sell them such mixtures.

•

To Build In Joliet, Ill.

Olin Mathieson Chemical Corp., New York, plans to build a phosphoric acid plant at Joliet, Ill. The capacity of the new plant will be approximately 50,000 tons per year. The phosphoric acid will be a 75 per cent concentrate.

•

Armour Production Manager

David W. Brochstein has been named production manager—fertilizer division by the Armour Agricultural Chemical Co., Atlanta, Ga. He had been plant manager in the Houston division and has been with Armour since 1948.

•

District Sales Manager

J. Frank Greeley has been named western district sales manager for the Multiwall Bag Division of West Virginia Pulp and Paper Co., New York. He will make his headquarters at the company's Torrance, California plant. He succeeds Frank L. Smith, who has resigned.

In his new position, Mr. Greeley will be responsible for the sale of the division's products in the western sales district which includes the states of California, Arizona, Nevada, Oregon, Washington, Idaho, Utah, Wyoming, Colorado and most of New Mexico.

Mr. Greeley joined West Virginia in April, 1958, when the company established its Multiwall Division. Mr. Greeley's previous assignment was as a product manager in West Virginia's multiwall bag division.

•

Emcol Division Manager

Dr. M. M. Gladstone has been named manager of the Emcol Division of Witco Chemical Co.'s Organic Chemicals Division. He had been assistant technical director of the division.

•

Three Named By Monsanto

The appointment of three directors of sales tops a list of personnel named to staff the marketing department of Monsanto Chemical Co.'s newly-formed agricultural chemicals division. J. Paul Ekberg is director of marketing for the division.

Named sales directors are: Dr. Peter G. Arvan, with responsibility for product planning; Sam R. Clement, who is responsible for major customer contacts and Monsanto's target account program; and G. C. Davis, who directs field sales operations.

States Relations Topics

Maurice B. Rowe, chairman of the States Relations Committee of the Association of American Fertilizer Control Officials has issued a list of subjects to be discussed at the group's meeting Oct. 13. The meeting is to be held in conjunction with the control officials meetings Oct. 13 and 14 in the Shoreham Hotel, Washington, D. C.

Among the topics listed by Mr. Rowe are: "What can be done to improve fertilizer statistics and keep such statistics up with the improved products which are available and in use?"; "Should pictures and promotional or sales material be included on specialty labels . . . ?"; and "How about requiring bulk delivery and/or spreader trucks to carry sample containers (suitable for mailing) and educate the farmer to take his own informational sample from each load for sending to the state laboratory?"

•

TVA Fertilizer Symposium

The Tennessee Valley Authority and the Southern Regional Soil Research Committee (Fertilizer Evaluation Work Group) will jointly sponsor a symposium on "Effects of Environment on Crop Response to Fertilizers" at Muscle Shoals, Alabama, on Jan. 25 and 26, 1961. The symposium will be held in connection with the annual fertilizer evaluation conference sponsored by these groups.

The first session will be concerned with moisture-yield response relationships and the other session will cover temperature effects on nutrient uptake.

Irvine Named Market Manager

Arthur E. Irvine has been appointed market manager — flexible packaging materials for Union Carbide Plastics Co., Division of Union Carbide Corp., New York. He succeeds J. R. Akers who has been appointed a product manager for Union Carbide International Company.

Mr. Irvine is responsible for the state of the company's participation in the flexible packaging market. He has been with Union Carbide Plastics Company since November, 1935 when he joined the Company working on chlorinated hydrocarbon products. From February 1, 1958 to his recent appointment, he has been a group leader in the company's development department, responsible for polyethylene film and extrusion coating materials.

•

Potash Deliveries Up 8%

Deliveries of potash for agricultural purposes in Contenintal United States, Canada, Cuba, Puerto Rico, and Hawaii by the eight American potash producers and importers totaled 4,285,160 tons of salts containing an equivalent of 2,508,016 tons K_2O during the fertilizer year of July 1959 through June 1960, according to the American Potash Institute. This was an increase of nearly 8 per cent in salts and K_2O over the preceding fertilizer year.

Total deliveries for all purposes were 5,168,550 tons of salts containing an equivalent of 3,044,172 tons K_2O, an increase of over 12 per cent in salts and K_2O over the last year.

Illinois with 240,324 tons K_2O was the leading state for deliveries, followed in order by Indiana, Georgia, Ohio, Florida, and Virginia. Deliveries do not necessarily correspond to consumption in a given state.

Muriate of potash was the principal grade, comprising over 94 per cent of the total agricultural potash delivered.

•

Sees Volume Rise in '61

American Agricultural Chemical Co., New York, should have higher sales in fiscal 1961 than it did in fiscal 1960, Charles M. Powell, president, said after the company's annual meeting last month. In the fiscal year ended June 30, 1960, sales were $90,004,015 and profit was $3,550,522.

Mr. Powell did not estimate profit for fiscal 1961. He said, however, that he can't "be rosily optimistic for the fertilizer business." He said it appears that farm income will be below last year and also noted that there might be a "temporary overproduction" of phosphorus-based fertilizer.

•

U. S. Assists In Surveys

Technical assistance by the United States in insect survey and detection programs is being made available to several countries of the Middle East, south Asia and Africa. Work done in these areas is expected to aid plant-protection efforts throughout the world.

•

Prim Appointed By Bemis

Donald E. Prim has been appointed field sales supervisor for the Bemis Bro. Bag Co., St. Louis. Mr. Prim is responsible for sales in Michigan and northwestern Ohio.

•

Velker Named Plant Manager

Harry E. Velker has been named manager of the Curtis Bay, Baltimore, normal superphosphate plant of W. R. Grace & Co., Davison Chemical Division.

Pesticide Committee Hears Contradictory Reports

CONTRADICTORY reports on the role played by pesticide residues on food in causing chronic diseases were presented last month to a special committee appointed by California's Governor Brown to consider public policy regarding the use of agricultural chemicals.

Dr. W. Coda Martin of Hollywood testified that "it has been well established by competent authorities that many of these chemicals interfere with the body's normal enzyme reactions and they are, therefore, directly responsible in part for the marked increase in degenerative diseases in the United States."

Dr. Francis M. Pottenger, chairman of the air pollution commitee of the Los Angeles County Medical Assn., said that he has seen the cholesterol levels of patients begin to climb in two or three weeks after exposure to pesticides.

"I can say that that I have seen individuals, who have elevated chlorinated hydrocarbon titers in their fat, which has increased over the years, show evidence of heart trouble that was not present before exposure," he said. He conceded, however, that "this is not proof that the chlorinated hydrocarbons cause heart trouble. It only demands further investigation."

Dr. William Fishbein, who identified himself as a former Chicago Health Department investigator and currently a private scientist working for chemical companies, said that there is no way of proving the allegations of Dr. Martin and Dr. Pottenger that chemicals are responsible for the degenerative diseases.

Other representatives of the chemical industry and agriculture declared that the chemicals present no hazard to health if they are properly applied by farmers and others making use of them.

Dr. Daniel G. Aldrich Jr., dean of agriculture at the University of California in Berkeley, said "we have no alternative but to protect our crops against pests, if we wish to feed the people of California and the United States.

"Without pesticides," he continued, "we would not have our present supply of many foods, and those that would be available would cost much more."

Dr. Emil M. Mrak, chancellor of the Davis campus of the University of California, presided over the committee meeting in Los Angeles. The next hearing will be held in Berkeley on Oct. 20 and another meeting will be held in Sacramento on Nov. 15.

Sales builders

At training sessions like these, IMC probed selling problems with over 500 fertilizer industry executives.

The latest visual presentation techniques were used to gain maximum impact. Meetings like these helped members of the fertilizer industry realize their full profit potential.

Selling approaches were carefully analyzed . . . from "why people buy" to "getting them to sign on the dotted line." This program has generated impressive sales results in many areas.

Markets were analyzed for sales potential. Participating executives saw demonstrations of practical selling ideas that help keep costs in line, manufacturing forecasts realistic and product specifications suited to area needs.

IN ACTION!

Last year, IMC briefed over 500 fertilizer industry executives on broadening markets . . . meeting objectives . . . closing sales

This fall, IMC Customer Training Meetings will feature technical seminars on better methods . . . more efficient production . . . ways to cut production costs

The IMC Customer Meetings will present technical information in the same interesting and informative manner used in the popular sales training meetings last year. Response to those meetings was immediate and enthusiastic. In 10 cities throughout the country, these two-day sessions were warmly received. Leading fertilizer executives made comments like this:

"This could revolutionize the fertilizer industry in marketing and merchandising. I'm sure glad I attended."

"Our time was well spent. This was the best meeting I can remember attending. It covered fundamentals, not flashy promotion."

"Our group was amazed by the number of good ideas and principles presented. Coverage was excellent."

"This type of meeting should be expanded."

Technical training offered to IMC customers

Now, because of repeated requests from IMC customers, including many who attended Sales Training Meetings, IMC has condensed solutions to the most troublesome technical problems confronting fertilizer manufacturers. Formulation, mechanization, maintenance and trouble-shooting are all part of this practical meeting agenda. Day-to-day problems will be discussed in 11 cities throughout the country.

Plan to attend the IMC Technical Training Meetings — one of which will be close to your city. Check below for time and places.

CITY	DATE
Minneapolis, Minn.	Monday, Tuesday, October 24, 25
Indianapolis, Ind.	Wednesday, Thursday, October 26, 27
Raltimore, Md.	Wednesday, Thursday, November 9, 10
New York, N.Y.	Monday, Tuesday, November 14, 15
Raleigh, N.C.	Wednesday, Thursday, November 16, 17
Toledo, O.	Monday, Tuesday, November 21, 22
Winter Park, Fla.	Monday, Tuesday, November 28, 29
Montgomery, Ala.	Wednesday, Thursday, November 30, December 1
Kansas City, Kan.	Monday, Tuesday, December 5, 6
Tyler, Tex.	Monday, Tuesday, December 12, 13
Jackson, Miss.	Wednesday, Thursday, December 14, 15

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*TRADEMARK

Work sessions helped each executive measure his own progress. These meetings . . . held in 10 cities . . . were well attended and highly praised for their practical and informative content.

Sales problems of individual participants were discussed in detail. These sessions dealt with practical day-to-day matters important to every executive in the industry.

These sessions' . . . forerunners of the 1960 technical seminars . . . were part of IMC's continuing program of help to the fertilizer industry.

FO-2-61

EXPANDA-KRAFT (newest, high-strength H&W bag stock) stops a Johnny Unitas pass

Johnny Unitas, all-pro quarterback, throws fast and hard and straight. We asked Johnny to help us demonstrate the strength and resilience of Expanda-Kraft. He had two targets: regular multiwall kraft and Expanda-Kraft. Each target had four plies of 50-lb. stock. The speeding pigskin ripped through regular kraft, but time after time it bounced off Expanda-Kraft. The picture shows where the ball left dents in the Expanda-Kraft.

Multiwall bags made of Expanda-Kraft:

Reduce breakage—Expanda-Kraft bags have two-way stretch, soak up shocks that would break ordinary kraft bags of equal basis weight.

Stack securely—They stack with less risk of slippage and stay in place while in transit, because of improved friction coefficient when compared with regular kraft bags.

Withstand moisture—Weathering and high humidity have little effect. They stay tough. Firm.

Print sharp—Their attractiveness increases your product's sales appeal. Expanda-Kraft White is unusually bright and takes fine printing beautifully. Semi-bleached and Natural shades do, too.

Fill fast—Expanda-Kraft bags have high porosity. And they're rigid enough to stand up to high production speeds on the filling line.

Expanda-Kraft, made by a new roll-crepe process, withstood the terrific impact of these Johnny Unitas bullet passes. It combines rigidity and moisture resistance with uniform toughness. Expanda-Kraft is available to multiwall bag manufacturers in 40, 50, 60, 70 and 80-lb. basis weights. Expanda-Kraft bags have proved their superiority over regular kraft bags in standard drop tests.

Expanda-Kraft is superior to regular kraft in impact test. These bags were filled with sand, suspended on long ropes, released and collided in mid-air. Only the regular kraft bag burst, yet it had the same ply construction as the Expanda-Kraft bag.

Contact your multiwall bag supplier for more information. Or, write *Hollingsworth & Whitney, Division of Scott Paper Company, Chester, Pennsylvania.*

SAFEGUARD YOUR PRODUCT IN EXPANDA-KRAFT*

*T.M. Scott Paper Company

HOLLINGSWORTH & WHITNEY DIVISION OF
SCOTT PAPER COMPANY

Russell Stoddard Dies

Russell B. Stoddard, who is credited with having been a key man behind the successful development of a purified pyrethrum extract for use in insecticides, died last month after a long period of ill health.

Mr. Stoddard began his chemical career in 1912. A graduate of Clark University, he taught organic chemistry at Lowell Textile Institute until 1917, when he became a research chemist on the staff of National Aniline Corp. Three years later, he joined Ungerer & Co., essential oil producer, and later moved over to van Ameringen-Haebler (now a division of International Flavors & Fragrances, Inc.).

In 1934 he joined R. J. Prentiss & Co. (now Prentiss Drug & Chemical Co.) and was administrator of the firm's rotenone business. Among his achievements at Prentiss was the opening up of a new source of rotenone root (which had previously come from Java and Malaya) in Peru, which today is the major world source.

In 1939 Mr. Stoddard joined Dodge & Olcott, Inc., where he became associated with a special research group working to develop a highly-purified pyrethrum extract for use by the Armed Forces. The development was the key to another project, the development of piperonyl butoxide as a pyrethrum synergist.

When U. S. Industrial Chemicals Co. purchased the insecticide section of D & O in 1945, Mr. Stoddard went to that company as coordinator of insecticide operations. In 1951 USI was absorbed by National Distillers, and three years later the insecticide activities of the company were acquired by Food Machinery & Chemical Corp. When the Fairfield Chemical Division was formed that same year, Mr. Stoddard was named manager of the division. In 1956 he became a consultant to the administrative officer of Food Machinery & Chemical Corp.

Mr. Stoddard served as a director of the National Agricultural Chemicals Association for a number of years and was active on several committees of the Insecticide Division of the Chemical Specialties Manufacturers Association.

•

To Manage Calspray Office

John B. Chance has been named branch manager in Goldsboro, N. C., for the California Spray-Chemical Corp.

Plant Nears Completion

Construction is more than 50 per cent completed on a phosphoric acid plant being built in Marseilles, Ill., by the National Phosphate Corp., New York. The plant was designed by Chemical Construction Corp., New York.

The facility is designed to produce 54 per cent P_2O_5 by the wet process, using Florida phosphate rock and 93-98 per cent sulfuric acid.

✓ TYPE 41 CLAY

In making organic concentrates using benzene hexachloride, chlordane, toxaphene, and other similar materials, it is important to have the concentrates free flowing.

TYPE 41 Clay can be combined with more costly diluents, such as Fuller's earth, and the result will be a free-flowing concentrate, at a lower cost to the producer.

TYPE 41 Clay has the following advantages:

- **NON ABRASIVENESS**
- **FINE PARTICLE SIZE**
- **ADSORPTIVENESS**
- **PROPER BULK**
- **HIGH INSECTICIDAL VALUE OF CLAY ITSELF**
- **LOW PH VALUES**
- **NO PHYTOTOXICITY TO PLANTS**
- **OUTSTANDING ABILITY TO STICK TO THE LEAF**

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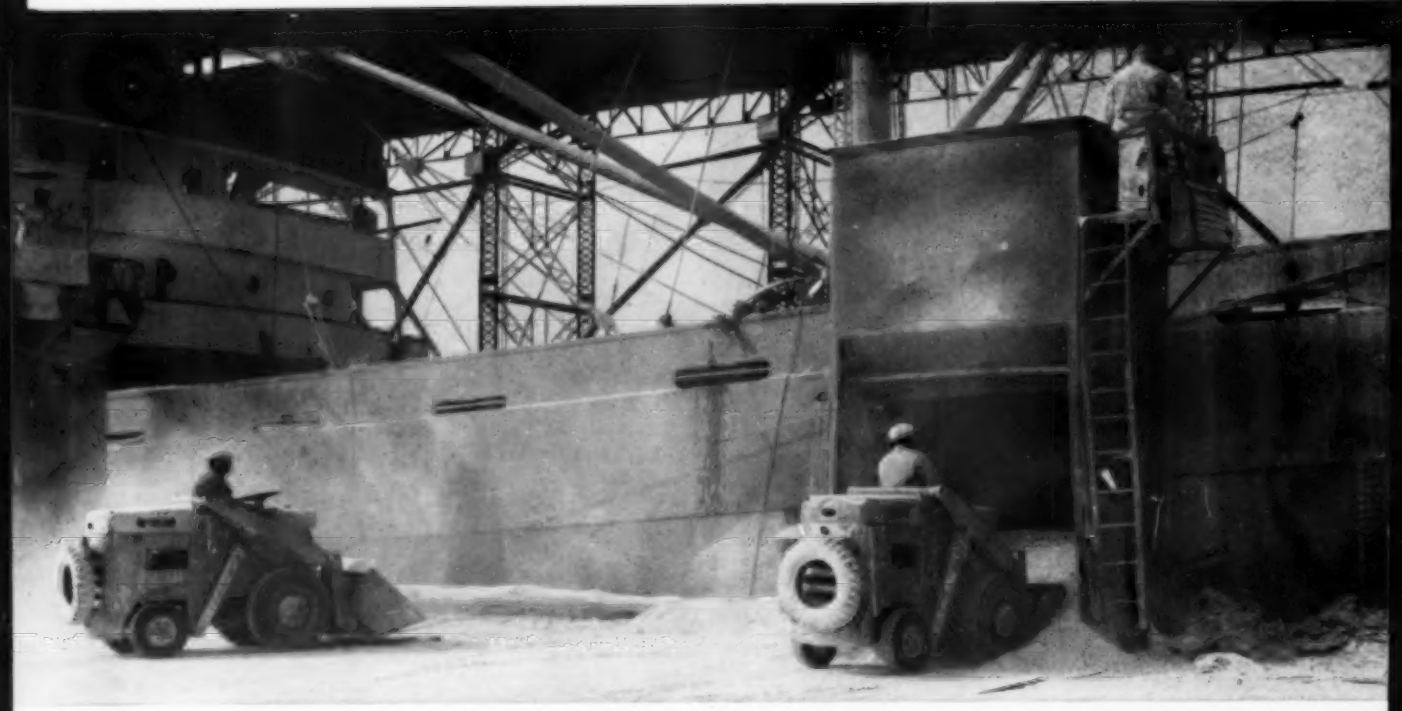

From ship to train or shoreside storage . . .

TWO MILLION POUNDS OF BULK MATERIAL

handled daily by 8 Michigan Tractor Shovels

On Philadelphia's waterfront, eight high-speed tractor shovels are moving the amazing total of two million pounds of bulk material *every 8 hour shift!*

The machines are 16 cubic foot Model 12B Michigans. Their job, for Independent Pier Co., is to transfer England-imported china clay from temporary shipside hoppers to waiting rail cars and storage bins. Despite the high-volume output, it's not an easy assignment. Material, when disturbed, rises in choking clouds of dust, quickly covering men and machines. Loads must be moved through traffic *60 to 900 feet*. And all work has to be done quickly to minimize high dock charges.

Under these pressures, Independent Pier has developed probably the fastest operation of its type along the waterfront—built around the speed and mobility of the eight Michigans.

Load-unload cycle averages 58 seconds

Approaching the hopper head-on, bucket skimming the dock, a Michigan in typical operation thrusts into the heaped clay. With flick of tilt-action lever, operator brings up his pay-load. No time is lost in repeated bucking; Michigan's pry-out action heaps bucket in a few seconds. At same instant, a flip of the forward-reverse lever backs the Michigan out of the hopper in a fast, tight turn. In "forward" again, the Michigan races for a boxcar, barely slowing to turn in—even through narrow six-foot doors. To heap

the clay as high as possible in either end of the car, the Michigan charges up the slope as if it were a hill. At top, operator simultaneously dumps bucket and power-shifts into reverse; the Model 12B backs down and swings out the door, ready to repeat the cycle. Operating at top speed through thick dust fog, over round trip haul cycles of 120 to 1800 feet, the Michigans have established a load-unload average of only 58 seconds!

Maintenance, new operators no problem

"Maintenance-wise" says master mechanic Mike Snowden Jr, "there's no comparison between these Michigans and other equipment. They not only need a lot less attention, they're much easier to service. A quick check at lunchtime—mainly knocking dust out of air filters—keeps them in top shape. Ruggedness and ease of operation are advantages, too. Hiring new stevedores every day means new operators for the Michigans—and *could* cause trouble. But new men learn fast on those simplified controls. They don't have to fight a clutch, either, and power steering is a big help pushing around in that clay."

Find out how Michigan ease of handling, speed and dependability can help *you*. Write us any time for complete details . . . or, better still, to arrange a no-obligation demonstration on your job.

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Fertilizer Short Course

The Iowa State University Fertilizer Dealers Short Course will be held Jan. 10, 1961, and the Fertilizer Industry Representatives Conference will be held Jan. 11, at the Memorial Union, Iowa State University, Ames, Iowa.

•

MGK Export Manager

McLaughlin Gormley King Co., Minneapolis, Minn., has appointed William D. Gullickson as manager of international sales. Prior to joining MGK in 1959, Mr. Gullickson held positions with the Hearst Corp., magazine division, and Conover Mast Publishing Co.

•

Plant Expansion Operating

Michigan Chemical Corp.'s bromine plant expansion at El Dorado, Arkansas, is completed and in operation, doubling the capacity of this facility, which is a joint venture with Murphy Corp. of El Dorado.

Transportation facilities also have been doubled through the expansion of the joint venture's tank car fleet, and extra storage capacity has been added.

•

Thomson Heads CFA

J. W. Thomson, sales manager of the agricultural chemicals division of Canadian Industries Ltd., Montreal, was elected president of the Canadian Fertilizer Association at the annual meeting of the organization at Murray Bay, Que., Aug. 25.

Other officers elected for the 1960-61 season were: William Houde, William Houde Ltd., Laprarie, Que., first vice president; G. H. Johnson, Swift Canadian, Toronto, second vice president; and R. P. Pennington, Potash Co. of America, Toronto, secretary-treasurer.

•

Bender Named By Chase

John J. Bender has been named manager of the Chase Bag Co.'s paper bag division plant at Crossett, Ark. He has been with Chase since 1951.

IMC Names McCoy To Sales

International Minerals & Chemical Corp., Skokie, Ill., has appointed Sinclair B. McCoy as manager of sales services for the materials department of the agricultural chemicals division.

Mr. McCoy has been with IMC for 33 years.

•

WACA To Meet March 13-15

The 1961 Spring Meeting of the Western Agricultural Chemicals Association will be held in Disneyland Hotel, Anaheim, Calif., March 13 to 15, 1961.

•

Rename Kaw Company

Kaw Fertilizer Service, Inc., Lawrence, Kansas, has been renamed Agricultural Business Company, Inc. The company's new trade mark will be "Agri-Bizz."

The firm began five years ago as a retail fertilizer business and now includes eighty dealers in seven states.

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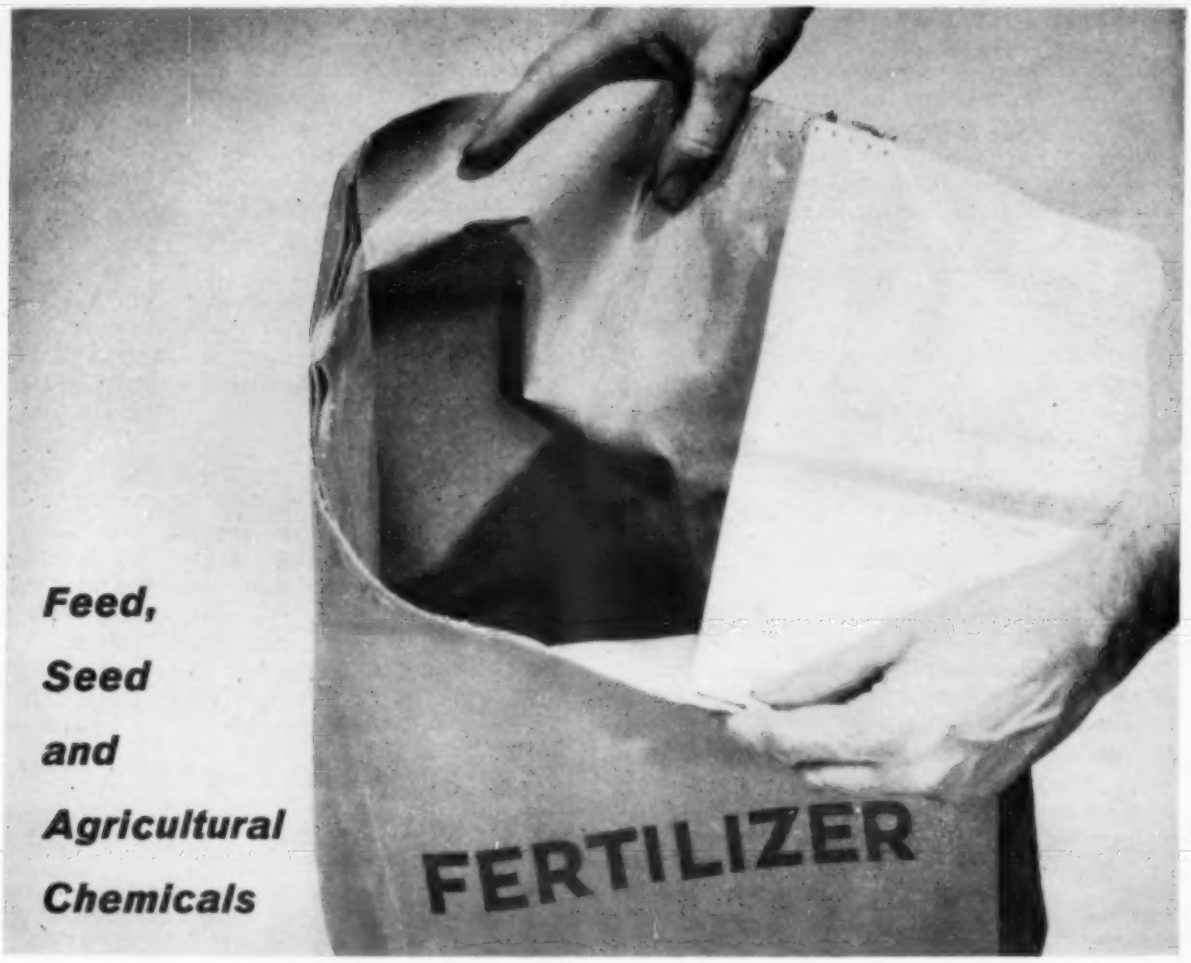

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MULTIWALL BAGS

WITH POLYETHYLENE COATINGS

Kraft multiwall bags with coatings of BAKELITE polyethylene give moisture protection far superior to that of other farm product packages. For you, this means practical opportunities for important savings and increased sales.

There is also improved resistance to grease and oils, more package strength and high chemical resistance. All this at a surprisingly low cost.

Why not investigate polyethylene-coated multiwalls now. And be sure to ask your supplier about the high performance levels possible with the newest polyethylene coatings.

For further information, see your packaging supplier, or write Dept. EO-2, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

BAKELITE and UNION CARBIDE are registered trade-marks of Union Carbide Corporation.

UNION CARBIDE

Chemetron Loses Appeal

The Georgia Court of Appeals has dismissed as premature an appeal by Chemetron Corp. in a $6.5 million lawsuit brought against it in October, 1958 by Southern Nitrogen Co. of Savannah, Ga. Southern Nitrogen claims damages for Chemetron's alleged delay and negligence in the construction of Southern's nitrogen fertilizer plant in Savannah, begun in 1956.

Last February, the City Court of Savannah had rejected Chemetron's argument that Southern Nitrogen could not legally recover lost profits included in its damage claims.

•

Pesticide Report Issued

The Conservation Foundation, New York, has sponsored a report by Albert C. Worrell, school of forestry, Yale University, entitled "Pests, Pesticides, and People." The report was published by the American Forestry Association, Washington, D. C.

The report points out that many people, in recent years, have become alarmed about possible hazards that pesticides may represent to man and animals and have been uncritically vehement in their attacks on pesticide use. "Some apparently have felt that the danger justified any tactics and have resorted to inflamatory public statements and writings of questionable factual content.

"Pest control workers, on the other hand, have considered this a threat—or at least a hindrance—to the performance of control activities so they have joined the controversy, sometimes with statements as questionable as those of their opponents." Under such conditions, the report states, it is difficult to know who or what to believe. Dr. Worrell's essay is an attempt to define the processes that go into a large-scale pest control program.

The existing pattern of pest control decision-making in the United States is more comprehensive and complete than most people realize, the report states. Two recommendations are included, however. The first is that greater efforts should be made to evaluate pest control decisions on a continuing basis and the second is that efforts be made to increase the provisions for obtaining information on pest control and pesticides at all levels.

The complete report is available from the Conservation Foundation, 30 East 40th St., New York 16.

Asst. Sales Director

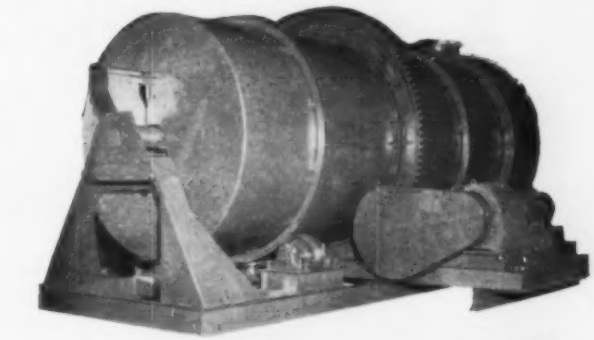
W. L. Klatt has been appointed assistant to the director of agricultural chemical sales for United States Borax & Chemical Corp., Los Angeles. He joined U. S. Borax in 1949.

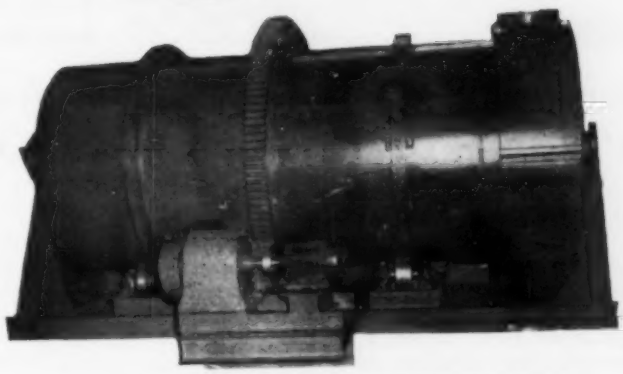
•

Heads Western District

William M. Hewat has been appointed western district manager of Naugatuck Chemicals, division of Dominion Rubber Co. Ltd.

Quality . . . by Atlanta Utility





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EAST POINT, GEORGIA — Phone: POplar 1-2104
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Spencer Advances Elleman

William L. Elleman has been named assistant to the vice-president of Spencer Chemical Co's Agricultural and Industrial Chemicals Division. He joined Spencer in 1942.

o

Heads Expanded Division

William L. Warren has been named sales supervisor for the newly-expanded southern division of Morton Chemical Co.'s Agricultural Division. The region includes 11 southern states from Virginia to central Texas. Mr. Warren, whose headquarters are in Memphis, Tenn., has represented Morton Chemical (formerly Panogen Co.) in the south since 1955.

At the same time, the company appointed Dewey B. Hudson as southern region equipment specialist.

Combustion Relocates Office

The Raymond Division of Combustion Engineering, Inc., has moved its offices to the John Plain Building at 427 West Randolph St. in Chicago. The division manufactures equipment used for pulverizing, separating, and drying a variety of materials.

•

Screwworm Found In Alabama

An infestation of screwworms was discovered Aug. 31 in Geneva County, Alabama, in a beef steer shipped from the Southwest. The infestation represents the easternmost case that has been reported since the last screwworms were found in central Florida in June 1959. All other animals in the Geneva County stockyards where the screwworms were discovered, were inspected and found free of the pest.

•

Jones Joins Clemson Staff

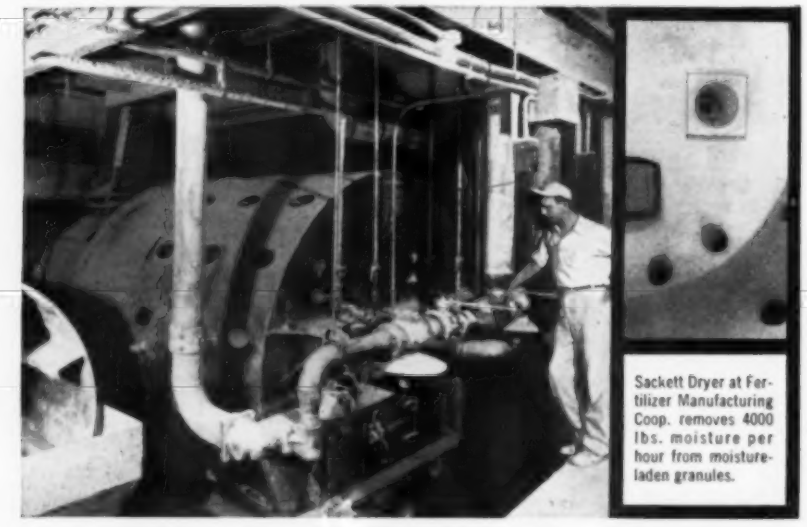
Dr. Ulysses S. Jones Jr., formerly chief agronomist for Olin Mathieson Chemical Corporation at North Little Rock, Ark., has been named head of the agronomy and soils department at the Clemson College School of Agriculture. Dr. Jones, who succeeds Dr. G. H. Collings, joined Olin Mathieson's agricultural chemicals operations in 1953.

•

V-C Appoints Three

Virginia-Carolina Chemical Corp., Richmond, Va., has appointed Frederick E. Van Nostran to its agricultural chemical technical service group, John H. Wilson to its agricultural chemicals development group in research and development, and Marion J. Mart to its agricultural chemicals sales staff.

Mr. Van Nostran is a former research plant pathologist for the University of Florida and South Dakota State College. Mr. Wilson is a former North Carolina Extension Service plant pathologist, and Mr. Mart is a recent graduate from Iowa State University with a B.S. degree in horticulture.



Sackett Dryer at Fertilizer Manufacturing Coop. removes 4000 lbs. moisture per hour from moisture-laden granules.

Plibrico lined furnace maintains output of

20 TONS fertilizer PER HOUR

. . . reports Albert Spillman, general manager of Fertilizer Manufacturing Coop.

Continuity of operation is imperative in this process. Shutdowns mean lost production. That is why this furnace, which reaches temperatures as high as 1100°F., is lined with Plibrico Standard Air Bond. The air-setting feature of this plastic refractory lining provides greater strength uniformly throughout the entire lining thickness of the dryer and transition chamber.

One-piece construction eliminates problems . . . no joints in lining to cause needless maintenance. No need, either, for costly special shapes. These built-in qualities assure not only ideal refractory efficiency but also durability which mean savings in repairs, replacement and shutdowns.

WRITE FOR FREE CATALOG 73 giving data on drying, calcining and processing or call your local Plibrico Engineer for technical assistance.

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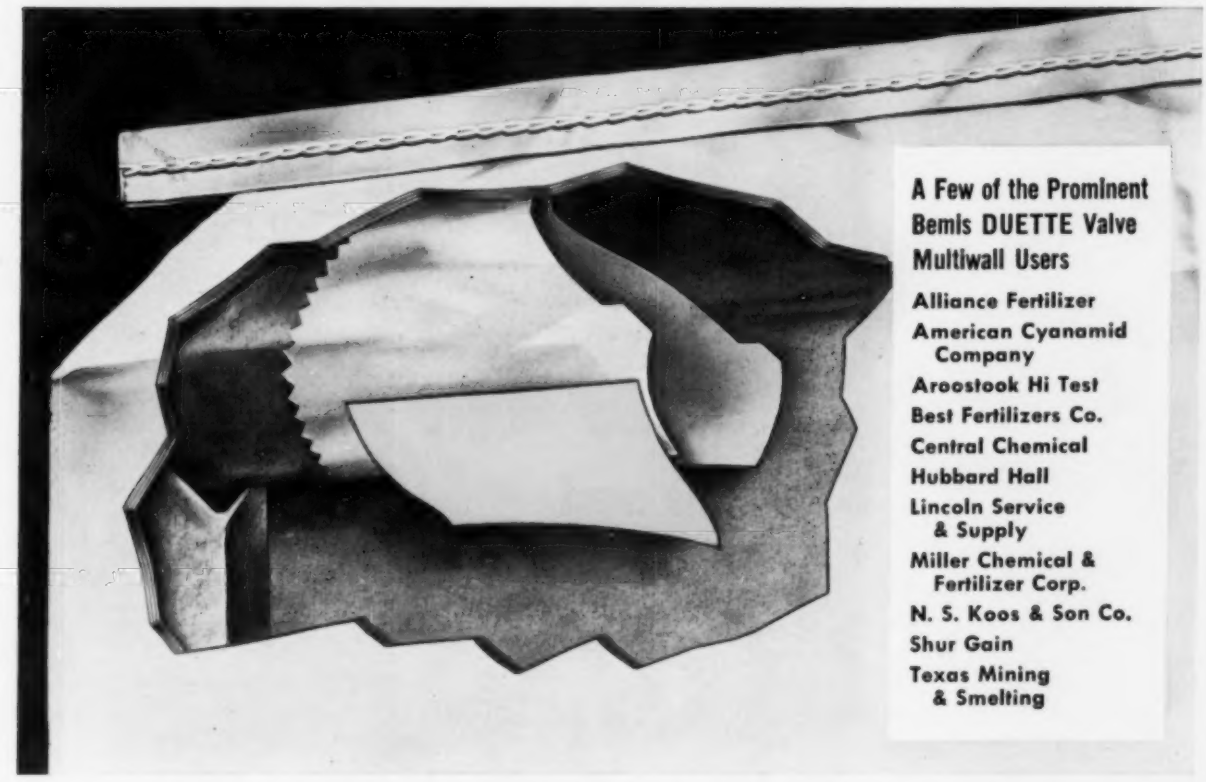
Bemis *Duette*® Sewn Multiwall Sleeve Valves Have Been Experience-Proved

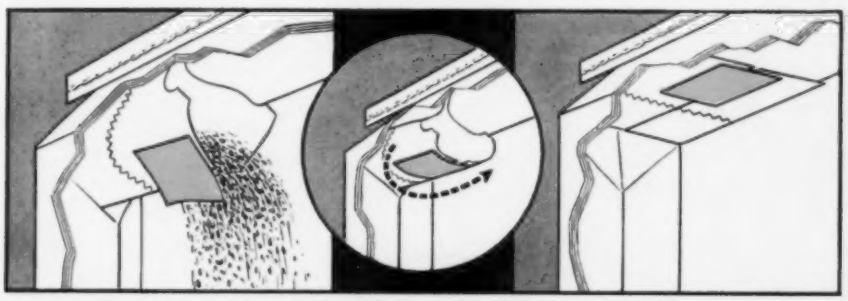


A Few of the Prominent Bemis DUETTE Valve Multiwall Users

- Alliance Fertilizer
- American Cyanamid Company
- Aroostook Hi Test
- Best Fertilizers Co.
- Central Chemical
- Hubbard Hall
- Lincoln Service & Supply
- Miller Chemical & Fertilizer Corp.
- N. S. Koos & Son Co.
- Shur Gain
- Texas Mining & Smelting

It's been more than three years since Bemis perfected the DUETTE, the multiwall bag valve-on-a-valve that gives double sift protection for granular, pelletized or pulverized products.

In that time, DUETTE Multiwalls have been used by many of the leading chemical and fertilizer manufacturers, with consistently gratifying results. The diagrammatic pictures show why . . .



WON'T CLOG . . . The Magic Yellow check flap falls freely aside from the valve slit. The sleeve won't choke or clog the packing spout.

POSITIVE CLOSING ACTION . . . This diagrammatic picture shows the action as the Magic Yellow flap starts to close over the valve slit.

CAN'T SIFT . . . When the bag is filled, the flap, acting as a check valve, completely overlaps and covers the valve slit, to stop sifting.

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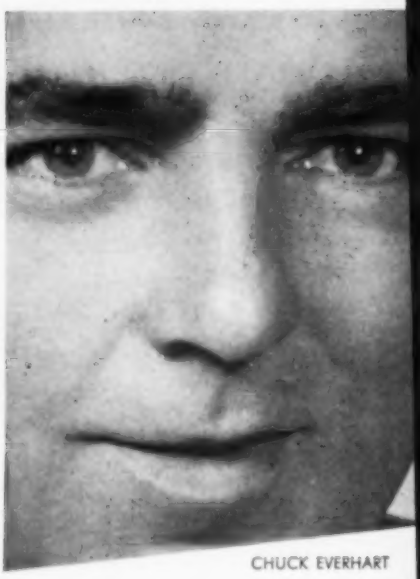

CHUCK EVERHART

These men help you get the most ...from U.S.I. fertilizer raw materials

TOM MARTIN

There's nothing more impersonal than a tank car sitting on a siding. But if it's a U.S.I. shipment on your siding, you'll find there's nothing impersonal about the service behind the U.S.I. oval. One call can bring a U.S.I. Technical Service Man to your plant . . . promptly. It may be Tom Martin, for instance, or Charles (Chuck) Everhart.

Chances are you know Tom, U.S.I.'s senior field service engineer in your area. Just about every fertilizer manufacturer does, since Tom's an oldtimer in the business . . . was a fertilizer plant manager himself. Tom knows our products . . . knows your products as well . . . combines this knowledge to your benefit.

Chuck is a long-time fertilizer man too . . . was also a fertilizer plant manager before coming to U.S.I. Chuck is an outgoing guy who likes people, likes working with them on their problems. And there are few problems in the fertilizer field he hasn't tackled at some time.

Tom and Chuck's definition of technical service is as broad as their experience. They'll help on shipping, equipment, unloading and storage problems, any aspect of production involving our chemicals — formulations, equipment recommendations, methods, start-up runs, costs. There's nothing cut-and-dried about their approach either. You'll find they'll listen to your slant on things . . . will be glad to exchange ideas with you.

These men work for you more than they work for us. Try them out if you have any problems on your next shipment of fertilizer raw materials—ammonia, nitrogen solutions, sulfuric or phosphoric acid.

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Stretch Paper Sales Up

After two years on the market, extensible kraft paper has begun to take a substantial portion of the market for shipping sacks in the chemical process industries, according to a report appearing in the Sept. 10 issue of *Chemical Week*. Some figures indicate that extensible paper is used for nearly 23 per cent of all multiwalls produced.

Much of the extensible paper now being produced is Clupak, made by a patented process owned and licensed by Clupak, Inc., New York. Scott Paper Co., Chester, Pa., also produces a similar material called Expandakraft. On a weight basis, extensible paper costs about 5 to 7 per cent more than conventional kraft, but bags made of it sometimes cost less because shippers can use fewer plies and thinner paper.

Another development brought out in the report is that more paper shipping sacks now embody moisture barriers of one kind or another —some 25 per cent—than, perhaps, at any previous time. The traditional asphalt laminated sheet is meeting competition from polyethlene and numerous other resins and copolymers as extrusion-coatings over kraft paper to provide moisture barriers.

•

Harris Appoints Aron

Harris Laboratories, Inc., Lincoln, Nebraska, has appointed C. Gilbert Aron as manager of its agricultural chemistry division.

He formerly was employed as chief analyst with Farm Crops Processing Corp., Omaha, and more recently has been chief chemist for Lincoln Grain Exchange.

•

Eastman Sales Manager

Frank W. Abernathy has been named a district sales manager of the chemical division of Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., New York. Mr. Abernathy's district includes New England.

Society Elects McCallan

S. E. A. McCallan, Boyce Thompson Institute, Yonkers, N.Y., was elected president of the American Phytopathological Society at the group's meeting in Green Lake, Wisc., Aug. 28 to Sept. 1.

Others elected were: W. B. Hewitt, U. of California, Davis, president elect; C. S. Holton, Washington State University, vice-president; Robert W. Fulton, U. of Wisconsin, editor-in-chief, *Phytopathology*; and Arthur Kelman, North Carolina State College, and A. L. Taylor, USDA, Beltsville, Md., who were elected councillors-at-large. A. W. Dimock, Cornell University, and G. A. Zentmyer, U. of California, Davis, were re-elected respectively as treasurer and secretary.

•

ESA Meeting In Atlantic City

The eighth annual meeting of the Entomological Society of America will be held in the Haddon Hall Hotel, Atlantic City, N. J., Nov. 28 to Dec. 1.

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ammonium nitrate fertilizer

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nitrogen solutions

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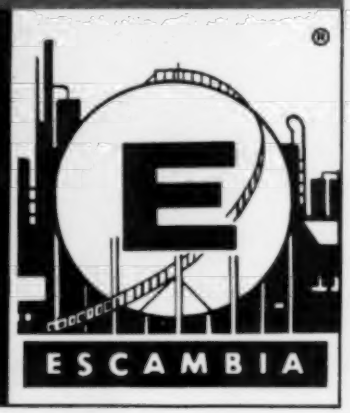

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NOW....PROMPT MOLTEN SULPHUR DELIVERIES

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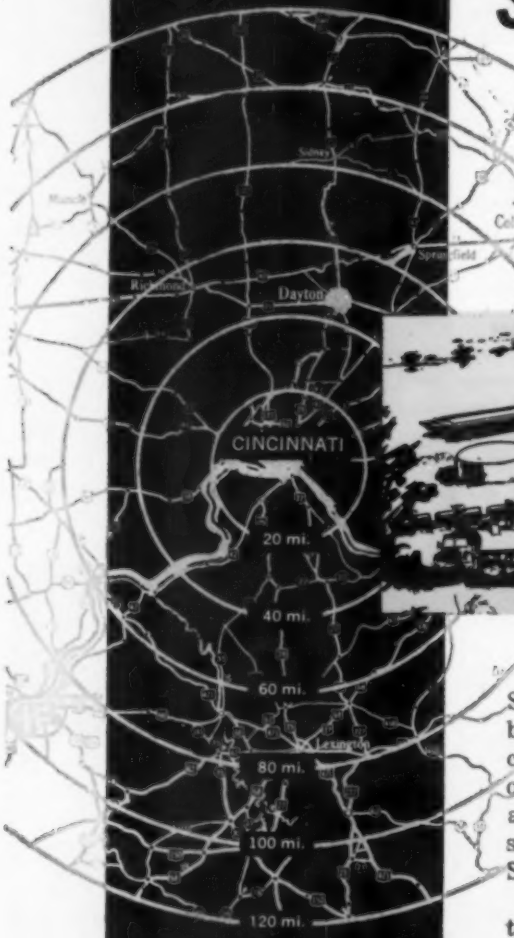

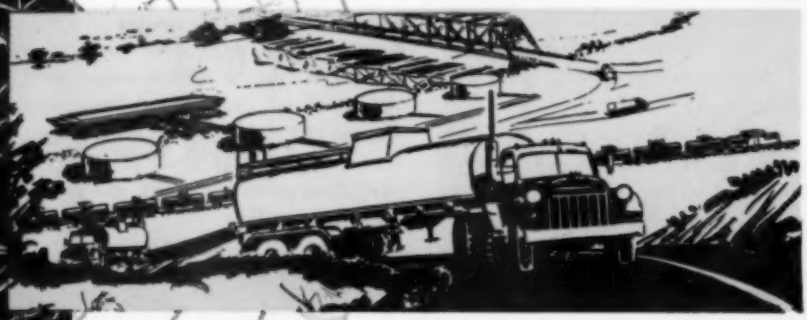

This is the first of the TGS Terminal Molten Sulphur Truck and Rail Distribution Stations being set up to serve industrial areas of the country. Regular large tonnage barge shipments of Molten Sulphur from our mines in the Gulf area are keeping this Cincinnati Terminal well-stocked to meet the growing demand for Molten Sulphur in the Ohio River area.

Additional Molten as well as Solid Sulphur terminals are being considered for other parts of the country.

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Molten Sulphur in tank *cars* can be delivered to any point in the States or Canada from our nearest mine or recovery plant. Barge deliveries of Molten Sulphur are available on all navigable inland waters. Solid Sulphur, as for many years, is deliverable all over the world. Large inventories at our mines assure industry it will get its supplies when needed.

Clear Potash Development

An order issued last month by the Department of the Interior has temporarily withdrawn some 9,445 acres of public lands in southeast Utah from oil and gas leasing to make possible the development of a deposit of high-grade potash.

The lands are in Grand and San Juan Counties, about nine miles southwest of Moab, Utah, near the Colorado River. The potash deposit was located at a cost of more than $2.5 million through systematic drilling by Delhi-Taylor Oil Corp. The Department of Interior decision clears a major obstacle to development of the lands by private enterprise because oil and gas drilling is not compatible with potash mining for reasons related to high rock pressures at depths ranging from 2,500 to 5,000 feet, which is where the potash deposits are to be mined.

Texas Gulf Sulphur Co., New York, recently paid Delhi-Taylor some $500,000 in advance for an option to sub-lease these lands from Delhi-Taylor. Reported plans for the development of the lode by Texas Gulf include construction of a 3,000-foot mine shaft, a 37-mile rail link, and a potash processing mill.

•

Paper Bag Price Increase

The Flexible Packaging Division of Continental Can Co., New York, has announced a price increase of approximately 3 to 6 per cent on certain paper product items, effective October 1. Among the paper packages affected are specialty coffee bags, dog food bags and other self-opening style bags used for chemicals, insecticides and other products.

•

Moves To Bartow Plant

Roy W. Biddle has been appointed general chemical superintendent of the Florida Phosphate Division of W. R. Grace & Co., Davison Chemical Division, and will make his headquarters at Davison's Bartow, Fla., installation. He had been manager of the company's superphosphate plant at Curtis Bay, Baltimore.

•

TAAA Dates Changed

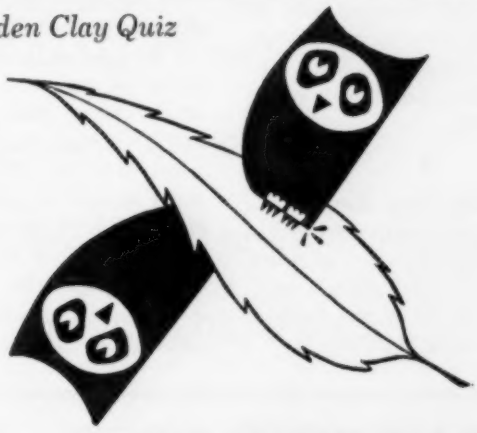
The dates for the 1960 convention of the Texas Aerial Applicators Association have been changed to November 10 to 13 from the earlier dates previously announced. The change was made so that the meeting will not conflict with defoliating work in west Texas.

Schneider To Sales Post

Harold R. Schneider has been appointed assistant sales manager for agricultural chemicals produced by Allied Chemical's General Chemical Division.

With the division 14 years, Mr. Schneider has been executive assistant for agricultural chemicals for the past four years. Earlier he served as agricultural field manager at General's Philadelphia sales office.

Barden Clay Quiz



DO YOUR DUSTS STICK TO THE LEAF?

They do if they contain Barden Clay. Barden sticks through rain or wind. Barden is the industry's kaolin standard for a carrier-diluent in wettables and dusts; for an anti-caking conditioner in prilled fertilizers, and 93-94 percent sulfur.

These Barden features make it superior for all formulations: lowest abrasion...better sticking...high bulking value...greater uniformity...better deposits ...maximum economy...superior wettables.

Working samples on request.

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The Low-Cost Scientific Diluent

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Interested in 75% Wettables and Concentrates? Zeolex 7A is the new synthesized carrier for top results. It's versatile, too: serves as a bulking agent, and as a static-free conditioner for 99 percent sulfur grinding. Write for more information.

Ammonia Volume Up

Returns from an annual volume survey conducted by the Agricultural Ammonia Institute, Memphis, Tenn., indicate a volume increase of 12 per cent for the first seven months of 1960, as compared with the same period last year. Returns were received from 78 ammonia distributors in 25 states.

Increases were reported by 42 distributors; 22 showed decreases, and 14 said that their tonnage was "about the same" as for 1959. Jack F. Criswell, executive vice-president of the Institute, predicted that 765,000 tons of ammonia will be shown to have been used as a direct application nitrogen fertilizer during the fertilizer year which ended June 30, 1960.

•

SE Branch Meeting Jan. 23

The Southeastern Branch of the Entomological Society of America will hold its 35th annual meeting Jan. 23 to 25 at the Admiral Semmes Hotel in Mobile, Ala.

Discussing the program of the first Alabama turfgrass short course are, left to right, Ed Parker, agronomist, Spencer Chemical Company, Griffin, Georgia; Dr. E. V. Smith, dean and director, Auburn University School of Agriculture and Agricultural Experiment Station; and Frank Boyd, president, Alabama Soil Fertility Society, Montgomery.

Alabama Turf Short Course

Producing better turf was the theme of the Alabama Turfgrass Short Course held September 12 and 13 at Auburn University, Auburn, Ala. Some 100 persons interested in turf management were on hand to hear reports on new developments and research in turfgrass management.

Major topics discussed were on controlling insects, diseases, and nematodes that attack turfgrasses, fertility requirements, and new developments in management. Speakers included researchers of the Auburn Agricultural Experiment Station and industry representatives.

Importance of controlling insects that damage lawns was brought out in a talk by Dr. W. G. Eden, Experiment Station entomologist. He named chinch bugs, fall armyworms, sod webworms, ants, ground pearls, white grubs, and earthworms as pests of turf in Alabama and gave latest control recommendations.

A highly destructive pest of turf, the fall armyworm, frequently appears by the thousands in mid- or late summer, Eden stated. When they cross a lawn, all foliage is eaten as they go. Effective insecticides are 10 per cent DDT, 20 per cent toxaphene, or 2 per cent endrin at 20 to 30 pounds of dust or granules per acre or as a spray, the entomologist said. He explained that normally only one generation appears in sufficient numbers to warrant treatment.

•

Bemis West Coast Rep.

David I. Daily has been appointed the west coast sales representative for the Packaging Service unit of the Bemis Bro. Bag Co., St. Louis.

•

Spencer Market Analyst

Brown Beasley has been appointed a senior market research analyst in Spencer Chemical Company's Agricultural Chemical Market Research Department.

Mr. Beasley has been associated with Spencer as an agronomist since 1952, devoting most of his time to fertility promotion work in the company's mid-south district.

•

NE Weed Meeting Jan. 4

The fifteenth annual conference of the Northeastern Weed Control Conference will be held at the Hotel New Yorker, New York, on Jan. 4, 5, and 6, 1961.

FEEDSTUFF & SOIL ADDITIVES

COPPER OXIDE
DICALCIUM PHOSPHATE
ZINC SULFATE

FUNGICIDES (Inorganic)

COPPER ACETATE
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COPPER OXYCHLORIDE SULFATE
COPPER SULFATE CRYSTAL
COPPER SULFATE MONOHYDRATE
COPPER SULFATE TRIBASIC

FUNGICIDES (Organic)

FERBAM
NABAM
THIRAM
ZINEB
ZIRAM

HERBICIDES

MCPA
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INSECTICIDES

CALCIUM ARSENATE
COPPER ACETO ARSENITE
COPPER ARSENATE
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SEE WHAT YOU CAN SAVE WITH

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Fertilizer	Usual Saving: **$3.80/M** bags
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In a WONDERWALL bag, fewer or lighter plies are needed compared to a natural kraft multiwall. Equally important, WONDERWALL withstands far more impact without breaking than conventional natural kraft multiwalls. Secret of WONDERWALL savings is in the "built-in" stretch of Clupak* extensible paper.

See how new WONDERWALL standard bag constructions can cut your costs, reduce bag breakage and increase customer satisfaction.

Mail coupon or call Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Ave., New York 17, N.Y.; 1400 Annunciation St., New Orleans 13, La.; and 555 Maple Ave., P. O. Box 2156, Torrance, Calif.

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MAIL THIS COUPON TODAY

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Gentlemen: Please send me more details on WONDERWALL bags. I now pack _____ (product)

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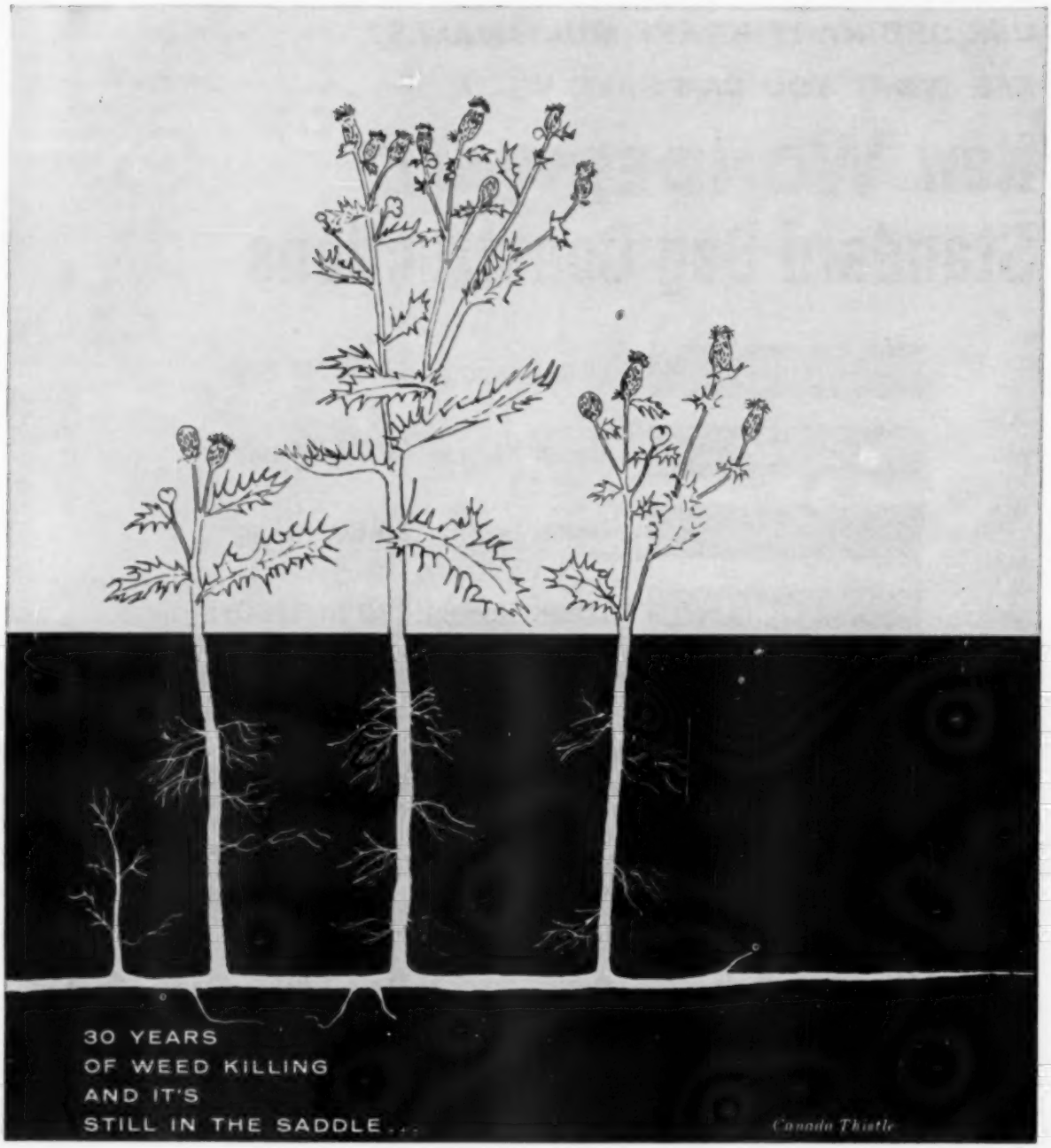
STREET _____

CITY _____ ZONE ____ STATE _____



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If you're going to use chemicals, Oldbury sodium chlorate is still the most dependable way to kill weeds.

It kills them all.

It's the most inexpensive way, too. For a mere 25¢, you can sterilize 100 square feet of drainage ditch, fence line or roadway for *at least* a year.

Open-head drum empties faster. Oldbury sodium chlorate comes in a fast-opening drum. A single lever seals and reseals the drum with a metal band. Full open head makes pouring, scooping, or shoveling easy.

Available in 50-, 100- and 450-lb. sizes.

Technical aid. Full-time Hooker agronomists can help with weed control plans and advise on handling, storing, and using sodium chlorate.

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Douglas S. Harkness, Minister of Agriculture for Canada, with outgoing president of CACA, R. B. Marr, (left), and newly elected president, J. K. Brown.

CACA Hears Resistance Report

THE Canadian Agricultural Chemicals Association attracted some 175 members and guests representing manufacturers of pesticides from Canada, the USA, and European countries to its eighth annual conference, held September 11-14 at the Britannia Hotel, Lake of Bays, Ontario. J. K. Brown, Green Cross Div., Sherwin Williams of Canada, Ltd., was elected president; J. G. Hastings, Chipman Chemicals, Ltd., was elected 1st vice-president; D. K. Jackson, Monsanto Canada, Ltd., was elected 2nd vice-president. It was announced that the 1961 meeting will be held September 18-20 at Mont Tremblant Lodge in the Laurentians.

Among the reports presented before the group attending the Ontario meeting, was a discussion on "Insect Resistance" by A. W. A. Brown, Univ. of Western Ontario. "Within the chlorinated hydrocarbon insecticides," observed the speaker, "we have two separate resistance types, which for convenience we call DDT resistance and dieldrin resistance. This separateness has been demonstrated not only in houseflies, but also in mosquitoes, body-lice, cockroaches, cattle ticks, and several agricultural species such as the cabbage worm, onion maggot and boll weevil.

"These two resistances to chlorinated hydrocarbon insecticides do not extend to the organophosphorus compounds, and this fact has much to do with the success and urgency with which this new group has been put into general use." But time has shown that some insects and mites have already developed resistance to the OP compounds. "No less than 28 species have already done the trick," said Mr. Brown. "Most of them are orchard mites, but some aphids, flies, and mosquitoes have also developed resistance."

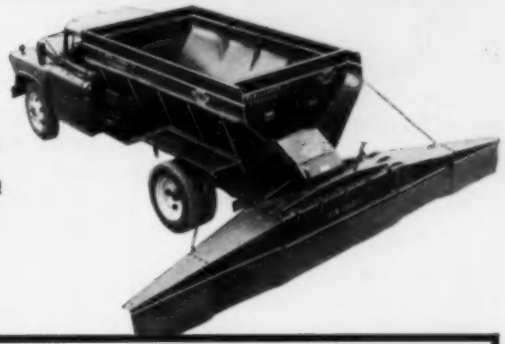
The speaker discussed the means by which resistance is developed, and reviewed specific resistance studies. "There is a great need for an entirely new group of insecticides," he asserted. "Perhaps we have them in the carbamates. Pyrolan, isolan and dimetilan were early and perhaps not too successful for houseflies, but of the later ones, Sevin has proved highly effective against orchard pests, and Hercules AC-5727 promises great things for malaria control in areas where the *Anopheles* mosquitoes are resistant to chlorinated hydrocarbons. However, there is an ugly suspicion that the carbamates may not constitute a new group with regard to resistance, for houseflies and yellow-fever mosquitoes made OP-resistant by OP pressure have also become resistant to Sevin.

(*Continued on Page* 125)

Accurate Lime and Fertilizer Spreads From 100 lbs. Per Acre and Up!

NEW LEADER L-32S SPREADER

- **12.5 H.P. Engine drives Twin Spinners for even spreads!**
- **24" Conveyor driven by PTO or drive shaft drive for precise per-acre requirements!**
- **Available with full line of optional attachments!**



DEMAND FOR CUSTOM SPREADING IS GROWING

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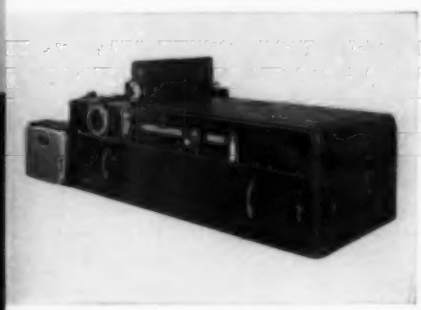
POSITIVE CONTROL OF MATERIALS IN MOTION B·I·F METERS FEEDERS CONTROLS

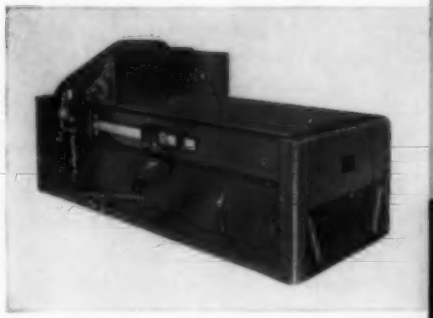
PROFIT FORMULA: QC + IC = BP/LC

QUALITY CONTROL + INVENTORY CONTROL = BETTER PRODUCTS AT LOWER COSTS

PNEU-WEIGH (Model 36-20) Weigher for:

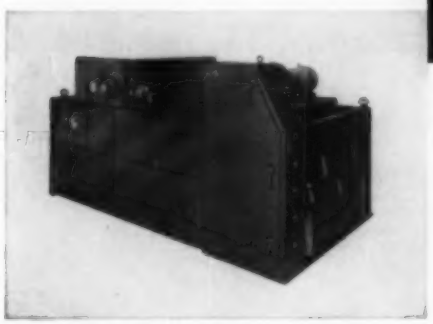
- proportioning coating agents to prills or granules
- proportioning acids to rock dust
- check-weighing incoming bulk ingredients
- checking recycle for process efficiency
- interdepartmental inventory checking





HI-WEIGH (Models 37-20 & 37-42) Weighing Feeders for:

- blending or feeding dry ingredients . . . ammonia, rock dust, solid nitrogen, potash, super, triple-super, etc.



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High fidelity formulation plus rugged dependability are essential to any profitable ammoniation or granulation process. Omega Feeders and Weighers subjected to the severest conditions, have maintained super-accurate fertilizer analysis . . . assuring top quality finished goods and preventing waste of vital ingredients.

MODEL 37-20
High Capacity – feed rates of over 3,000 lbs. per min.
High Accuracy – ± 1% by weight of set feed rate within range
Wide Range – provided by 100:1 variable speed transmission
Bulletin – 35-N62

MODEL 37-42P
Extra High Capacity – feed rates to 10,000 lbs. per min.
High Accuracy – ± ½% of max. weight (weigher); ± 1% by weight of set feed rate within range (feeder)
Wide Range – 10:1
Bulletin – 35.20A-1

MODEL 36-20
High Capacity – 0 to 10, 100, 500, 1000, 2000, 3000 lbs. per min.
High Accuracy – ± ½% of maximum rate
Wide Range – 10:1 (constant speed drive); 50:1 (variable speed drive)
Bulletin – 36-P1

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For complete data on any of these feeders or weighers, request descriptive literature. Write to **B-I-F Industries, Inc., 536 Harris Avenue, Providence 1, R. I.**

(*Continued from Page* 123)

"There is one carbamate, called by Phillips, Roxane S.17, which does not induce resistance to itself, but does induce OP resistance and a terrific resistance to DDT and dieldrin. The advantages of making one's competitors products useless are obvious."

In a review on research and marketing, J. S. Wilson, Dow Chemical Co. of Canada advised, "If one were to list the major problems facing the agricultural chemical industry here are three that would be high on the list:

—the need for more effective, selective, and safe pesticides

—the need to educate the user or potential user so that pesticides will be used more widely and intelligently

—the need for a more profitable enterprise

"While one might call these three separate problems, they are at the same time very closely related. It is the cost of tackling problems one and two that is requiring this industry to seek greater profitability."

Other discussions on marketing agricultural chemicals included Louis F. Czufin's (Californa Spray Chemical Co.) report on selling and advertising; a discussion on credit, by W. H. Hunter, Chipman Chemicals, Ltd.; distribution by J. Neil, Niagara Brand Chemicals; pricing an agricultural chemical, by R. F. Byrnes, Rohm & Haas Co. of Canada, Ltd.; and advertising, by L. Havard, Green Cross Products.

•

Four Join Crag Staff

Four new technical representatives have been appointed to the Crag Agricultural Chemical staff by the Union Carbide Chemicals Co., division of Union Carbide Corp., New York.

They are: Richard Baughman, J. Charles Blue, J. W. Durfee, and Daniel J. Leary. The four will be assigned to marketing regions following an orientation period at Crag headquarters in New York.

Award To Shell Scientist

Dr. Johannes van Overbeek, (right), chief plant physiologist at Shell Development Co.'s Modesto, California, agricultural research laboratory, receives an honorary doctor's degree in agricultural science from Prof. A. Lecrenier, Rector of the Institute Agronomique de l'Etat at Gembloux, Belgium.

The recent ceremony took place at Gembloux and marked the Institute's centennial celebration.

Dr. van Overbeek presented one of the two doctoral acceptance addresses at the Institute Agronomique ceremony. A native of the Netherlands, he joined Shell's Modesto staff as Chief Plant Physiologist in 1947, leading research in auxins, herbicides and other growth-regulating chemicals. Prior to this, he had served on the staff of the California Institute of Technology and headed plant physiology research at the Institute for Tropical Agriculture in Puerto Rico.

•

Spencer Names Two

William F. Harris and John Naylor have joined the Agricultural Chemicals Division of Spencer Chemical Co., Kansas City, Mo., as salesmen. Mr. Harris represents Spencer in Mississippi and Louisiana and Mr. Naylor is Spencer's second salesman in Missouri.

In another move announced by the company, Charles Majors, sales representative in New York and Pennsylvania, has moved to Spencer's north-central district as a technical service representative.

•

Dr. Dye Retires

Dr. Harry W. Dye, plant pathologist, has retired after 37 years with the Niagara Chemical Division of Food Machinery and Chemical Corp., Middleport, N. Y. During his tenure with Niagara, Dr. Dye specialized in technical service to sales.

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Nabam — Tried and true low cost fungicide. Gives low cost spray solution for blight on potatoes, tomatoes, celery, cucurbits, etc.

Diram — for tank-mix Ferbam and Ziram.

Thiram — for disease control on fruit, or mix with other carbamates for improved disease control on vegetables.

Ferbam — wettable powder for fruit, tobacco, grapes, etc.

Ziram — wettable powder for potatoes, tomatoes, cucumbers, celery, etc.

Purified DDT — the safe insecticide for cucurbits and other crops sensitive to regular DDT.

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Max. biuret: 0.33% • For dry application

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Max. biuret: 0.25%

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Ware Scholarships To 12

Twelve students at mining and agricultural colleges have been named winners of the first Louis Ware senior-year scholarships. The $1,000 awards are sponsored by International Minerals & Chemical Corp., Skokie, Ill.

In addition, the six winners in each category become eligible to compete for $3,000-a-year, three-year fellowships, one in mining and one in agriculture.

Winners of the 12 awards are chosen annually by special faculty committees at each school, and compete in their senior year for the fellowships. Agricultural scholarship winners are:

Melvin Mathias, Purdue University; Leroy Hushak,, Iowa State; Charles Kesner, Michigan State; Guy Honold, Wisconsin; Wayne Brooks, North Carolina State; Paul Gould, Cornell.

Mining scholarship winners are:

Steven Clark, Minnesota; Terry Turner, Missouri School of Mines; William Seery, Colorado School of Mines; Joseph Conway, Penn State; Richard White, Michigan College of Mining and Technology; Martin Merz, Stanford.

•

New York Nurserymen's Show

The New York State Nurserymen's Association will hold its annual convention and trade exhibition at the Concord Hotel, Kiamesha Lake, N. Y., Nov. 29 to Dec. 1.

•

Award Contract To Leonard

Leonard Construction Co., Chicago, has received the contract for engineering and construction of a contact sulfuric acid plant at Brewster, Fla., for American Cyanamid Co., New York. Completion is scheduled for mid-1961.

•

NPFI District Representative

Dr. James M. Brown, formerly agronomy extension specialist for the North Carolina Extension Service, has been named district representative for the National Plant Food Institute, covering the states of Alabama, Mississippi, and Tennessee. His headquarters are at 1071 Terrace Acres, Auburn, Alabama.

•

To Raise Production By 25%

American Potash & Chemical Corporation's production of potash will be increased over 25 per cent when previously announced expansions at the firm's Trona plant are completed in mid-1961, it has been announced by Wm. J. F. Francis, vice president, marketing.

New granulation facilities are being installed in conjunction with the increased primary potash production which will boost output of new, improved granular muriate of potash for agricultural purposes. The expansion program, which will affect all of the plant's primary products, includes construction of a large fourth evaporator unit and other process changes.

Chinese Output Poor

In a report on the Communist Chinese chemical industry, contained in *Chemical Week*, Sept. 10, it is brought out that China's ambitious fertilizer program, under a five-year plan formulated in 1956, has fallen far short of production goals.

In 1958, for instance, the country imported $67 million worth of chemical fertilizers. There were no exports. There are seven fertilizer plants already existing or under construction in China but only a few of the planned 66 medium and small projects which were to have been started in 1958 are in operation. The seven big plants still supply about 80 per cent of China's total chemical fertilizers. At the present rate of progress, it is predicted, it will take China a decade to achieve production of even half of the 20 million metric tons per year of fertilizer it needs.

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P-19

National Distillers To Merge

A merger of Federal Chemical Company, Inc., Louisville, Ky., a manufacturer of mixed fertilizers, with National Distillers and Chemical Corporation has been approved in principle by the boards of both companies.

National Distillers will offer eight shares of its common stock for each outstanding share of Federal Chemical common stock and four common shares for each Federal preferred share. Federal has 20,000 common shares and 21,494 preferred shares currently outstanding.

Since 1950, National Distillers has been active in the manufacture of a wide variety of industrial chemicals, including such fertilizer raw materials as phosphoric acid, sulfuric acid, ammonia and nitrogen solutions.

After completion of the merger, Federal will be operated under its present name by its present management, officers and staff as a division of National Distillers and Chemical Corporation. Headquarters will continue at Louisville. Federal's plants are located in Louisville; Humboldt and Nashville, Tenn.; Danville, Ill.; Butler, Indiana; and Columbus, Ohio.

•

Add Storage Units

Mid-South Chemical Corp., Memphis, Tenn., has added a 9,500 ton refrigerated, atmospheric pressure ammonia storage tank at Memphis and a pair of spherical storage vessels to its plant at North Pekin, Ill.

•

Fertilizer Safety Meeting

The fertilizer Section of the National Safety Council meeting will be held at the Morrison Hotel in Chicago, Oct. 17 and 18. Sessions will be held in connection with the National Safety Congress and Exposition which will begin Oct. 17 and continue through Oct. 21.

A feature of the meeting will be a panel discussion on disabling injuries, to be moderated by Elmer C. Perrine, Nitrogen Division, Allied Chemical Corp., New York. Members of the panel will be: Mike C. Ellison, Mississippi Chemical Corp., Yazoo City; S. J. Edmond, Armour & Co., Chicago; R. L. Freeman, Butler Chemical Co., Galena Park, Texas; and Norman F. Maddux, Florida Nitrogen Co., Tampa.

•

IMC Signs Agreement

Electric Reduction Co. of Canada, Ltd., Toronto, and International Minerals & Chemical Corp., Skokie, Ill., have entered into an agreement providing for the sale of Electric Reduction's phosphate fertilizers in the United States through IMC's agricultural chemicals division. Electric Reduction presently is building a large phosphatic fertilizer plant at Port Maitland, Ontario, with production scheduled for early 1961.

•

CFA To Meet Nov. 13 to 15

The California Fertilizer Association has released the program for its 37th annual convention to be held at the del Coronado Hotel, Coronado, Calif., on Nov. 13 to 15. Featured speakers will be Tyler MacDonald, senior vice-president, Hixson & Jorgenson, Inc., Los Angeles, and Leon V. Tichinin, Santa Clara Agricultural Extension Service, University of California, San Jose.

Mr. MacDonald will speak on "The New Look in Selling," and Mr. Tichinin will describe his experiences as one of two Russian-speaking authorities on American agriculture to go to the American National Exhibition in Moscow during the summer of 1959. The title of his talk is "What I Learned from 20,000 Russians in Moscow."

•

Stewart Joins Chemagro

Samuel F. Stewart has joined Chemagro Corp., Kansas City, Mo., as a sales representative. He will make his headquarters in Carlisle, Pa., and will service a territory that includes the states of Pennsylvania, New Jersey, Maryland and Delaware.

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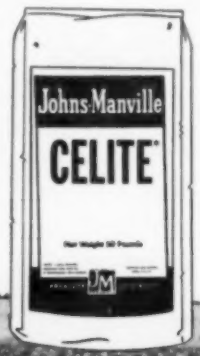

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S. C. Plant Food Meeting

The annual meeting of the South Carolina Plant Food Educational Society will be held November 21 at the Clemson House (Clemson Agr. College), Clemson, S. C.

•

Shell District Manager

Eric E. Heuermann has been named district manager of agricultural chemicals for Shell Chemical Co. at San Francisco, Calif. He had been a Shell Chemical district manager at Atlanta, Ga.

•

Two Join Black Products

Black Products Co., Chicago, has appointed George H. Garrett as southern district manager with headquarters in Irving, Texas, and Harry N. Bullard as western district manager with headquarters in Inglewood, Calif. The company offers the Black Diamond line of valve bag packing equipment.

Granulation Problems Outstanding

THE most persistent technical problems facing the fertilizer manufacturer today are those involving semi-granulation, formulation, and granular production.

This is the conclusion reached after tabulation of service calls for the early months of operation of the recently organized technical service staff of International Minerals & Chemical Corp., Skokie, Ill. IMC's five technical service regions cover the United States and Canada east of the Rocky Mountains.

General service calls, with no one problem standing out, accounted for 113 of the total of 445. The remaining 332 were divided as follows:

Semi-granulation	50
Formulation	48
Granular production	42
Equipment and production	37
General production	37
Product service call	30
Pan granulator	18
Liquid fertilizer	17
X-O-X production & preneutralization	16
Bulk blending	16
Acidulation	14
Specialty grades	7

Problems in semi-granulation, which headed the list with 50 calls, have multiplied as smaller plants seek to meet the competition of the fully granulated plants, in the opinion of Richard G. Powell, IMC Manager of Technical Service.

"Semi-granular units generally are installed as stop-gap measures to let the owner decide whether to go ahead with investment in the more expensive full granulation unit," Mr. Powell explained. "The conversion of a plant producing pulverized fertilizers to semi-granular operation provides problems in particle sizes, nitrogen losses, and other areas."

He noted that formulation problems, second highest at 48, most frequently cover two categories—the most economical way of formulating for the exact product desired, and the avoidance of off-analysis materials through losses and overages. Trained technical service men have been very sucessful in assisting in all areas of formulation.

Granular production, next in line with 42 requests, is tied closely to formulation, Mr. Powell noted. He said granulating unit owners constantly seek a minimum of recycling and maximum of on-size materials to get the most from their equipment.

The classifications "general production" and "equipment and production" were differentiated in that the former refers to a complete re-evaluation of the entire production system of a given plant; the latter indicates that technical service was called for regarding a specific piece of equipment and its relation to the production problem.

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Do you have an agronomic or fertilizer manufacturing problem? Do you want more efficient, more economical production? Why not tell us about it.

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GROW Profitable GRASSES

JAY B. FORD has been appointed director of administration for United States Borax & Chemical Corp., Los Angeles.

PRODUCTION ROUNDTABLE

(*From Page* 103)

particle size is also a guide to effectiveness of any agglomeration or granulation process employed.

Another physical factor, "particle hardness," is significant where a granular product is concerned. Particle hardness data offers information on probable break-up in handling,—and to some extent the rapidity of solution in soil waters. Particle hardness is measured by the weight required to crush a single pellet.

Close control of temperatures at various stages of a fertilizer processing system will contribute toward: reducing nitrogen losses; controlling water losses in the process; etc. Prolonged heat or excessive heat may also have a deleterious effect on ortho-phosphate, to the extent of reducing "availability.

The above discussion concerns some of the simple tools required in modern fertilizer technology, for the efficient and economical production of a uniform product.★★

FERTILIZER USE

(*From Page* 47)

was not used for direct application to as great an extent as in 1957-58.

Consumption of potash products increased generally in 58-59, except for potasium sulfate and a few of the miscellaneous potash products for which the decreases were negligible. The quantities of secondary and trace nutrient materials used during 1958-59 for direct application were substantially higher than for the previous year, particularly those containing calcium and sulfur. The use of gypsum (1,160,667 tons) which comprised nearly 95%of the tonnage of this class of product used, increased 271,965 tons (30.6%) .★★

ACS MEETING

(*From Page* 40)

often prilled and sold separately. The solubility of the finished fertilizer depends to a large extent on the calcium removed from the process.

Other general observations by Mr. Hignett indicate that ammonium nitrate is replacing ammonium sulfate as a source of nitrogen to make higher analysis fertilizers. The ammonium nitrate is added as a hot solution or polycrystalline material. In making superphosphate, emphasis is on a high percentage of "on size" material. The superphosphate is ammoniated as it comes out of the bin, without curing. The inclined pan granulator is common in granulating superphosphate; other granulation equipment is used for mixed materials. Considerable urea is made in Europe, noted Mr. Higett, however, little is used for fertilizer,—most of it being directed to other chemical processes.★★

(*To Be Continued Next Month*)

FERTILIZER VIEWS

(*From Page* 87)

expert analyst may succeed in interpreting the results of a soil test as a help in planning a rotation or in fertilizing a single crop. It is a job for the expert and not the dilettante. In this case, it is a professional sin to oversimplify the extreme difficulties inherent in soil-crop relationships, because it can lead to and encourage abuses that will discredit a good practice, and in the long run damage the integrity of the industry. Keep soil testing on a professional basis.★★

Glendon's
INSECTICIDE GRADE
PYROPHYLLITE
The ideal diluent and carrier for insecticides

★ *Chemically inert*—Insecticide Grade Pyrophyllite (aluminum silicate) has a pH range between 6 and 7. Because it is non-alkaline and chemically inert, it is thoroughly compatible with all leading pesticide chemicals. Will not react with them and lower their effectiveness.

★ *Non-Hygroscopic*—Dusts compounded with Glendon's Insecticide Grade Pyrophyllite will not absorb moisture. Thus there is no tendency for the finished formulation to cake even following long storage.

★ *Uniform* — Ground in a continuous mill and then treated in an air separator to remove oversize particles, 92 to 95% of the resulting product will pass a 325 mesh screen. Average particle size is below 5 microns. Weight, 32 lbs. per cu. ft. Because of its favorable physical characteristics and uniformity it forms homogeneous mixtures with pesticides and will not, like some other diluents, settle out from the active ingredients upon standing.

★ *Superior Adhering Properties* — Because it is difficult to wet, Glendon's Insecticide Grade Pyrophyllite clings firmly to plant leaves even through heavy rains.

★ *Superior for Aerial Application* — When used as a carrier in dusts for aerial application, Glendon's Insecticide Grade Pyrophyllite has been demonstrated to settle more quickly than other diluents, thus minimizing the hazards of drift, waste of toxicant and failure to hit target areas.

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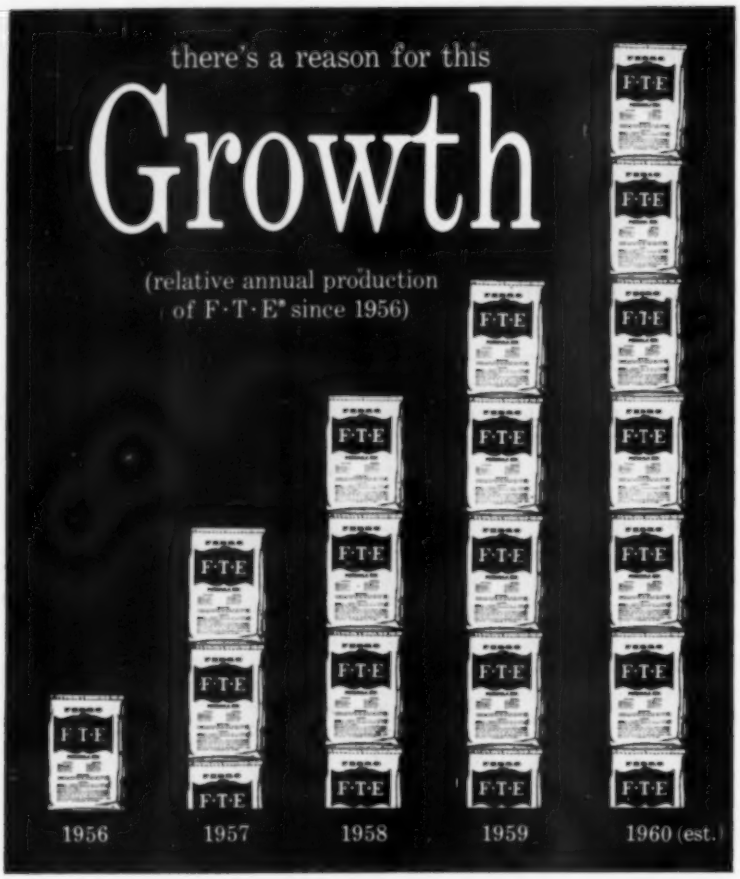

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PEST ROUNDUP

(*From Page 94*)

an extent that many cotton fields in the State carried 50-100 per cent square infestations. Populations were reported on the increase in South Carolina, with third-generation weevils being numerous and migration underway in some upper Coastal Plain and lower Piedmont Counties. Square infestations in Georgia varied widely, with counts up to 99 per cent. In Washington County, Georgia, the square infestation average was 50 per cent.

Boll weevil infestations were increasing in the Tennessee Valley and Sand Mountain areas of Alabama by late August. Fields which previously had light populations were carrying 25-50 per cent infestations. Infestations also were building up in rank cotton in southwestern Tennessee counties, and in local spots of the Mississippi delta, where controls will be necessary in most fields. Populations in Arkansas were such that if heavy rains should occur, boll weevils were expected to become a problem. In Oklahoma, the heaviest infestations, 0-30 per cent, were in the east central and southeast sections. Heavy populations continued in poorly treated fields of the Waco, Texas, area and remained a serious threat in succulent cotton in several sections of the State.

Bollworms were on the increase in most of the cotton-growing states. Damage was reported from Alabama, Tennessee, and Oklahoma. Populations were on the upward trend in South Carolina, Mississippi, Louisiana, Arkansas, Texas, New Mexico, and Arizona.

The face fly which was reported as an economic livestock pest in this country for the first

time last year, continued its westward spread. During August, the fly was reported from Nebraska and Minnesota for the first time. Populations were on the increase in Illinois where the fly was the number one livestock pest. Economic populations were present on cattle in many areas of northern Indiana, and a horse herd in Walworth County, Wisconsin, was seriously attacked by face flies.

Counts of over 100 face flies per animal on some heifers in the University of Vermont herd were recorded, while numbers were increasing in southern Maine. In central New York, dairy herds averaged 200 per animal where annoyance was serious. A survey during the week of July 13-22 showed face flies to be present in every dairy and beef herd inspected in central, eastern, and northern New York.★★

LISTENING POST

(*From Page* 97)

beginning about the middle of July. The 20 part per million concentration was tested in 1957 and and 1958, 10 parts per million in 1957 only, and 5 parts per million in all 3 years. By October 1, when foliage retention was estimated, unsprayed trees had from 2% to 8% of their leaves remaining in the tops of the trees only, while cycloheximide-sprayed trees had kept from 90% to 95% of their foliage.

Corm and Soil Treatment

Lester P. Nichols (3), of Pennsylvania State University, compared several different treatments for effectiveness in the control of bacterial scab (*Pseudomonas marginata*), one of the most common gladiolus diseases in Pennsylvania. Flower production is not usually affected by corm lesions, but may be seriously reduced by the neck rot phase of the disease, according to Nichols.

In 1958, occurrence of the disease was slight and the control experiments were therefore inconclusive. However, it was noted that emergence of shoots and date of flowering were delayed almost 2 weeks where treatments containing mercury were used.

The experiments were repeated in 1959. Nichols compared the standard treatments of a corm dip at planting time in 90% mercurous chloride (calomel) or 5% ethyl mercury phosphate (New Improved Ceresan) with the following treatments: a mixture of 60% thiram and 15% dieldrin (Delsan A-D) dusted on the corms; corms soaked in *N*-ethylmercuri-1,2,3,6-tetrahydro-3,6-*endo*-methano-3,4,-5,6,7,7-hexachlorophthalimide (Emmi); and corms soaked in Emmi and planted in rows treated with a 5% granular formulation of heptachlor.

The Emmi-heptachlor treatment caused delay in plant emergence. Differences among treatments in total flower production were not large, but all treatments containing mercury caused a delay of up to 2 weeks in flowering. The best treatments from the standpoints of scab control and size of corms were the thiram-dieldrin (Delsan A-D-) and the Emmi-heptachlor treatments.★★

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Corn fodder or forage (may be fed to dairy or meat animals)	7 days before harvest
Cottonseed	no time limit
Cucumbers	no time limit
Eggplants	1 day before harvest
Grapes	no time limit
Non-bearing citrus	no time limit
Ornamentals	no time limit
Peaches	1 day before harvest
Pears	1 day before harvest
Peppers	1 day before harvest
Plums, prunes	3 days before harvest
Potatoes	no time limit
Strawberries	3 days before harvest
Summer Squash	no time limit
Tomatoes	1 day before harvest

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DIVISION OF UNION CARBIDE CORPORATION

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AG CHEM

Equipment, Supplies, Bulletins

New Sewing Attachment

Bemis Bro. Bag Co., St. Louis, has developed a sewing attachment that is said to simplify and speed the closure of multiwall paper shipping bags. The Sew-Rite attachment, which is mounted on the sewing pedestal, permits the bag to adjust itself properly before engaging the sewing machine. The machine carries the bag to the sewing machine and reduces thread and needle breakage due to improper handling of bags by operators during sewing operations.

Circle A-101 on inquiry card, page 137

AC

Randolph Finishes Folder

A 4-page folder describing the finishes for plastics offered by the Randolph Products Co., Carlstadt, N. J., is available from the company. The brochure describes the coatings available for the range of plastics from acetates to vinyl, and lists application procedures.

Circle A-102 on inquiry card, page 137

AC

Test Grinding System

Bradley Pulverizing Co., Allentown, Pa., is operating a small roller mill system for test grinding a variety of materials. The mill also will be included in the company's line and offered for pilot plant and production operation.

The system includes a raw material elevator and feed bin, 33" i.d. mill with two or three rolls, finished material bin, secondary dust collector, and electric control panel.

Circle A-103 on inquiry card, page 137

AC

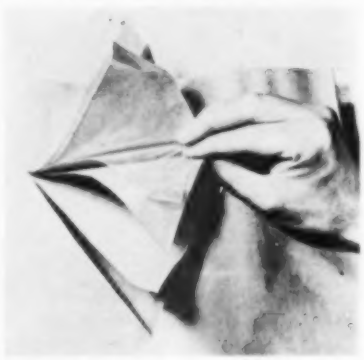
Package Granulating Process

A compact granulating unit was announced recently by A. J. Sackett & Sons, Baltimore. The complete granulating plant has a capacity as low as 5 tons per hour, other granulating units offer capacities as high as 25 tons per hour.

Circle A-104 on inquiry card, page 137

AC

Chase Offers Poly-Ply Bags



A line of moisture-resistant multiwall shipping sacks with a polyethylene-and-paper construction is being offered by the Chase Bag Co., New York.

Named the Poly-Ply Multiwall, the bags feature a multiwall structure that includes a separate, intermediate ply (not a liner) of light-weight sheet polyethylene, spot-pasted at top and bottom to adjacent layers of heavy duty kraft paper. With this arrangement, the polyethylene film is not next to the product and is protected from abrasion and other mechanical injuries. Standard sizes are 25, 50, and 100 pounds.

Circle A-105 on inquiry card, page 137

AC

Hooker Chemicals Digest

Ninety-four organic and inorganic chemicals produced by Hooker Chemical Corp., Niagara Falls, N.Y., for industry and agriculture are reviewed in a revised and enlarged, 16-page, quick-reference digest, "Hooker Chemicals," published by the company.

The new bulletin, No. 100-D, covers 88 commercially produced Hooker chemicals and six development products. Included are more than 20 new or recently developed chemicals.

Circle A-106 on inquiry card, page 137

AC

Dangerous Vapor Detector

A new M-S-A Mercury Vapor Detector for on-the-spot checking of dangerous concentrations is offered by Mine Safety Appliances Co., Pittsburg, Pa.

Circle A-107 on inquiry card, page 137

AC

BIF Belt Weigher

A pneumatically operated belt (stream) weigher for the continuous weighing of dry materials at low to medium rates is offered by the Omega Division of BIF Industries, Inc., Providence, R. I.

Hi-Weight, is a feeder designed especially for blending or feeding such dry ingredients as: ammonia, rock dust, solid nitrogen, potash, super, triple super, etc.

Pneu-Weigh is a weigher for proportioning coating agents to prills or granules; proportioning acids to rock dust; check weighing incoming bulk ingredients; checking recycle for process efficiency; inventory checking.

Circle A-108 on inquiry card, page 137

AC

Flat Belt Conveyor

Adaption of its Model GA-11 offers greater flexibility in bagging operations, according to Richardson Scale Co. A new flat belt conveyor, which can be adjusted in height (up to 12 inches) as well as length (from 7 to 12 feet), is designed for all package conveying, and to convey filled bags from weighing and packing equipment through a sewing operation.

Circle A-110 on inquiry card, page 137

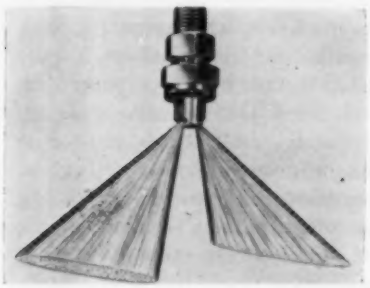
AC

Polyethylene Coated Bags

Kraft multiwall bags coated with high density polyethylene are suggested for packaging feed, seed, pesticides, ammonium nitrate, and other fertilizers. The coated bags provide moisture resistance and can be used on standard bagging and closure equipment.

Circle A-111 on inquiry card, page 137

Flat Spray Nozzle



Spraying Systems Co., Bellwood, Ill., is offering a nozzle that projects two flat sprays, separated by an angle of 60 degrees. The forward projected spray provides coverage of leaf areas as the plant is approached and the backward projected spray provides coverage as the plant is passed by.

The unit is supplied as a complete TeeJet Spray Nozzle or as a TeeJet interchangeable orifice tip for use with any TeeJet Spray Nozzle assembly.

Circle A-112 on inquiry card, page 137

AC

Fogging Mixtures Additive

American Cyanamid Co., New York, has prepared a booklet on the use of Thiosperse as an additive for fuel oil mixtures used in thermal fogging operations. Thiosperse is said to improve the solubility of malathion in fuel oil and prevent sediment formation.

Circle A-113 on inquiry card, page 137

AC

Force Flow Valve Bag Packer

St. Regis Paper Co., New York, recently announced a new Force Flow valve bag packer which can be used to pack fertilizer products with widely different flow characteristics, structure and size. Special features include pneumatic mechanical controls, availability of 1,2,3 or 4-tube models. Granular or pulverized goods are handled equally well by the machine.

Circle A-114 on inquiry card, page 137

AC

Tobacco Insect Control

Methods for control of common tobacco insects are described in a brochure on Thiodan insecticide being offered by Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, N.Y.

Copies of the brochure, which describes when and how to use Thiodan to control aphids, hornworms, budworms, fleabeetles, and other pests of tobacco, are available from the company.

Circle A-115 on inquiry card, page 137

•

Automatic Rotary Blender

An automatic rotary blender and hopper, on a movable bed was announced this year by Sturtevant Mill Co., Boston, Mass. The unit can be used to blend materials as they come from other operations, and introduce them directly into a subsequent process.

A supplemental hopper holds other ingredients to be introduced into the next process, yet keeps them from intermixture until the appointed time. The blenders are available in capacities of from 500 pounds to 20 tons.

Circle A-116 on inquiry card, page 137

Bulk Material Handler

A new, centrifugal action, bulk material handler for loading box cars was announced recently by the Conveyor Division of Finco, Inc., Aurora, Ill. Called the "Flinger," the loader-piler uses a high-speed rubber belt to increase the velocity of falling material in the feed-spout. As the belt flexes over a pulley, material is flung as directed.

Circle A-117 on inquiry card, page 137

•

Frontier Chemicals Booklet

Frontier Chemical Co., Wichita, Kans., has prepared a booklet listing each of its products and describing the manufacturing processes, grades, containers, and end uses. Among the products described are; chlorine, BHC, and grain fumigants.

Circle A-118 on inquiry card, page 137

October, 1960

AGRICULTURAL CHEMICALS
Reader Service Department
P. O. Box 31
Caldwell, New Jersey

Please send me information on the "New Equipment" items circled below.

A-101	A-109	A-117	A-125
A-102	A-110	A-118	A-126
A-103	A-111	A-119	A-127
A-104	A-112	A-120	A-128
A-105	A-113	A-121	A-129
A-106	A-114	A-122	A-130
A-107	A-115	A-122	A-131
A-108	A-116	A-124	A-132
			A-133

Name ..... Title .....

Company .....

Company Address .....

City ..... Zone.....State .....

Meter for Phosphate Slurry

Magnetic flow meters for accurate measurement of flow of partially filtered phosphoric acid slurry are described in a bulletin offered by Foxboro Company, Foxboro, Mass. The company points out that by watching slurry flow rates on a recorder chart connected to the magnetic meter, an operator can regulate precisely the feed of sulfuric acid to reactor tanks, permitting better quality control.

Circle A-119 on inquiry card, page 137
AC

Fertilizer, Pesticide Blender

Poulsen Company's Uni-Blender allows mixing, elevating, grinding and bagging of pesticides or fertilizers. The unit can handle four to six 1200 to 1500 lb. batches of field strength dust per hour. Other capacities are available. The Uni-Blender is designed to allow switching from custom-mixed to standard mixtures.

Circle A-120 on inquiry card, page 137
AC

Sprout-Waldron Laboratory

Sprout-Waldron & Co., Muncy, Pa., has opened a new testing laboratory in which full size commercial machines are installed in such a way that sufficient volumes of material can be handled to give accurate capacity and finished product data. The laboratory is located one block from the company's main manufacturing plant in Muncy.

Circle A-121 on inquiry card, page 137

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Pesticide Attachment on Bagger

Kraft Bag Corp., sales agent for the Kraftpacker automatic open mouth bag filling machine, has developed two new Kraftpacker attachments. One attachment is designed to add and mix a specified amount of regular or pulverized insecticide or herbicide to each bag of fertilizer as it is filled by the Kraftpacker. The other attachment is designed to add liquid insecticide or herbicide to the fertilizer.

Circle A-122 on inquiry card, page 137
AC

Ammoniator-Granulator

Among equipment offered for the fertilizer industry by Atlanta Utility Works, East Point, Ga., is a TVA Type Ammoniator-Granulator. Complete weight is 35,000 pounds, diameter 8', length 16'. The unit is fitted with forged steel tires and cast steel ring gear and pinion.

Circle A-123 on inquiry card, page 137
AC

Carlile Plant Bulletin

A new brochure, illustrated with photographs of existing plants, describes the Carlile processes for production of wet process phosphoric acid and ammonium phosphate fertilizers, including diammonium. Carlile plant construction utilizes sectionalized design.

Plants described in the text range in capacities from 30 tons per day of P_2O_5 to 200 tons per day, and from five to 25 tons per hour of high analysis ammonium phosphate. The booklet is available from J. C. Carlile Corp., Cooper Building, Denver 2, Colo.

Circle A-124 on inquiry card, page 137
AC

Centrifugal Impact Mill

Control Mill, a contrarotating centrifugal impact mill is offered by Entoleter Division of Safety Industries, Inc., New Haven, Conn. The mill has double-rotor action, low rotational speeds and high impact velocities. It is suggested for pesticide milling.

Circle A-125 on inquiry card, page 137

Pesticide Mill

Fine particles, ¼-micron average, and narrow particle distribution are reported in performance data using the "Jet-O-Mizer" mill, designed and built by Fluid Energy Processing & Equipment Co., Philadelphia. The manufacturer advises that other features of the equipment are: continuous operation, no attritional heat, low maintenance, and other operations with grinding (such as dehydration, blending, coating particles).

Circle A-126 on inquiry card page 137

AC

Fertilizer Cooler-Dryer

McDermott Brothers Co., Allentown, Pa., offers a booklet utilizing on-the-job photographs of installations of cooler-dryers for granular fertilizer plants. McDermott also designs, builds, installs kilns.

Circle A-127 on inquiry card page 137

AC

Michigan Tractor Shovel

Power shift transmission, torque converter, and planetary-wheel drive axle are among the features of Clark Equipment Co.'s Model 12B Michigan Tractor Shovel. The manufacturer reports that Model 12B readily handles tight-packed and hard-to-dig fertilizer. Capacity for this model is 3,000 pounds. Buckets are available to carry from 6 to 27 cubic feet.

Circle A-128 on inquiry card page 137

AC

Insecticide Grinding Mill

Combustion Engineering, Inc., Raymond Div., offers a booklet describing a full line of modern mills for insecticide grinding. Different types of mills in various sizes for large or small plant capacities are available. Major applications for the Whizzer Imp Mills include preparation of all common multi-component dusting formulations direct from technical material. The Vertical Mill gives excellent results on concentrates of 50 per cent or higher. The Raymond Roller Mill is particularly suitable for sulfur dust and sulfur-bearing insecticides.

Circle A-129 on inquiry card page 137

Semi-Automatic Bagger

A semi-automatic bagger, Model GA-17, is designed particularly for use in fertilizer plants. Offered by Richardson Scale Co., Clifton, N. J., the equipment handles all bag sizes (10 to 140 lb. capacities) up to 10 bags per minute. Pins, levers, and plates in contact with fertilizer are made of stainless steel. The complete unit is 3 feet 11 inches high. Richardson offers a bulletin describing this model.

Circle A-130 on inquiry card page 137

AC

Bag Closing Machine

George H. Fry Co., Mineola, New York, describes its sealer and gluer bag closing machine, Model CSG, in a company brochure. The closing equipment is suggested for insecticides, fertilizers, chemicals, powders, and other granular products.

Circle A-131 on inquiry card page 137

Lime, Fertilizer Spreader

In a booklet, "Your Land is Different," Highway Equipment Co., Cedar Rapids, Iowa, discusses ways of selling more bulk fertilizer, through the convenience of bulk spreading service. Highway outlines advantages of their New Leader L-32S fertilizer and lime spreader. A 12.5 hp engine drives twin spinners for even spreads; 24-inch conveyor is driven by PTO or drive shaft.

Circle A-132 on inquiry card page 137

AC

Tanks for Nitrate Solutions

R. D. Cole Manufacturing Co., Newnan Ga., offers a bulletin, "Tanks and Equipment for the Plant Food Industry," describing, among other equipment, their welded aluminum tanks for nitrate solutions. Cole also handles stainless steel, monel and other alloy tanks and pressure vessels in conventional and custom-built designs.

Circle A-133 on inquiry card page 137

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NEWS BRIEFS

A. E. STALEY Manufacturing Co., Decatur, Ill., has appointed Paul J. Breyfogle to be superintendent of its dry starch section. He had been assistant superintendent.

AC

EDWARD J. NORMAN retired recently after 15 years of service as grove supervisor for the Florida East Coast Fertilizer Co.

LAMBERT J. GROSS has been elected vice-president and treasurer of Combustion Engineering Inc., New York.

AC

GASPAR TORRES JR., has joined Stauffer de Mexico as sales representative. He will cover the west coast of Mexico from Culiacan north to the border from his headquarters in Hermosillo.

AC

DR. STANLEY B. FREEBORN, a medical entomologist and Chancellor Emeritus of the University of California, Davis, died recently of cancer. He was 68. Dr. Freeborn had taught entomology at the Davis campus for 45 years.

AC

ROGER C. CORWIN has joined the International Chemical Development and Operations Department of Food Machinery & Chemical Corp., New York. His responsibilities are centered in the development of foreign subsidiaries and licensees.

Chemical Control of White Fringed Beetle

The August issue of *Agricultural Chemicals* reported on various chemical control measures for white fringed beetles, in an article by Hiram C. Young. (pages 36, 37). A table (on page 37) listing dosages of various pesticides was incorrect. Correct rates follow:

Table 1. Application of Insecticides to Control White-Fringed Beetle Larvae

Type of land	Insecticide	Broadcast		Drill rows	
		Pounds per acre	Years effective	Pounds per acre	Years effective
		Soil treatment			
Cultivated	Aldrin	2	3 or more	¾ to 1	1
	Chlordane	5	3	1 to 2	1
	DDT	10	4	2 to 3	1
	Dieldrin	1½	4 or more	½ to ¾	1
	Heptachlor	2	3 or more	¾ to 1	1
		Surface treatment			
Noncultivated	Dieldrin	3 to 5	4 or more		

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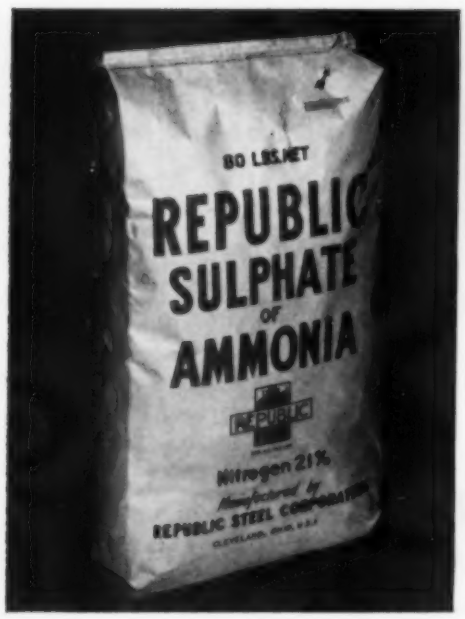

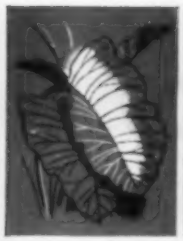

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FUTURE EQUIPMENT

(*From Page* 92)

flying motor scooters to flying saucers, also indicate that the agricultural aviation industry can look forward to continuing improvements in flying equipment and techniques. Although many of the more radical types of air craft now on the drawing boards may not appear to meet the particular demands of agricultural aviation, they can be expected, at least, to accelerate the by-product of progress that turns excellent air craft into obsolete air craft and makes them available at reasonable cost to agricultural applicators.★★

FARMER ATTITUDES

(*From Page* 42)

Summary

IT appears that the majority of farmers have accepted the basic idea of the use of agricultural chemicals for weed control – 92 per cent of the farmers were using some agricultural chemicals. Agricultural chemicals are used by the greatest number of farmers for weed control. However, for all categories of agricultural chemicals, the use patterns are at a low degree of intensity–there are low average dollar expenditures, and they seem to be used primarily on a specific field, "spot" or "fencerow" basis. Farmers think of using agricultural chemicals mainly in terms of getting rid of a nuisance or for pest control, rather than in terms of specifically "increasing profits." The greatest limiting factors to the use of agricultural chemicals at more nearly optimum levels, according to the famers, were: purchase costs; lack of necessary application equipment, the risk and uncertainty involved in use, and; the belief that they are now using all they need. From the farmers' point of view, these may be "valid" reasons; taking into consideration the present basic understanding of agricultural chemicals, their specific uses, how to apply them, the results to expect and the potential economic returns. However, from the point of view of those groups that are interested in securing optimum farmer use of agricultural chemicals, this lack of knowledge and these attitudes should offer a challenge for well conceived, adequately planned and properly implemented education, service and merchandising programs.

The data presented here do not answer all the questions, even from the farmer use pattern and attitude point of view. More data will be forthcoming from:

(1) More intensive analysis of the data from the study reported in this article;
(2) From reinterviews of this same sample in 1960;
(3) And, from agricultural chemical dealer studies – now all in process and in the Iowa State University Agricultural Experiment Station projects.

It is hoped that the data presented in this article will give some quantifiable base for generalization and stimulate those concerned to probe more deeply into the problem area of farmer use patterns and attitudes toward agricultural chemicals.★★

FLY REPELLENTS

(*From Page* 44)

toxicity was determined by the University of Virginia Medical School. The acute oral LD_{50} for rats is 6.23 gms/kg. The 90 day subacute feeding tests on rats at the two per cent level show no significant pathological changes (Wisconsin Alumni Research Foundation). None appears in the milk from sprayed cows. Registration of this repellent has been approved and it is being used in cattle sprays.

The pyrethrum was Pyrocide 175 RC containing 20 per cent pyrethrins obtained from McLaughlin Gormley King Company.

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The MGK-264, N-(2-ethylhexyl)-bicycloheptene dicarboximide, is a pyrethrum and repellent synergist from the same company. Piperonyl butoxide is a well known pyrethrum synergist from the Fairfield Division of Food Machinery Company. The base oil was a deodorized kerosene, APCO-467, from Anderson-Prichard Company.

Formulations tested. The above materials were tested in eight formulations listed below. The concentrations are given as grams per 100 ml in APCO-467.

A.	1207	1.0
	MGK-264	2.0
B.	Pyrethrins	0.025
	Piperonyl butoxide	0.25
C.	1357	1.0
	MGK-264	2.0
D.	MGK-326	1.0
	MGK-264	2.0
E.	1207	0.5
	MGK-264	2.0
F.	Pyrethrins	0.01
	1207	0.5
	MGK-264	2.0
G.	Pyrethrins	0.04
	1207	0.5
	MGK-264	2.0
H.	Pyrethrins	0.05
	R-326	0.4
	MGK-264	0.2
	Piperonyl butoxide	0.12

Results

CONDENSED results of the five series of tests for a six-day period are shown in Table I. The number of stable flies and of horn flies was recorded separately. The percentage repellency based on the untreated checks was calculated for each species separately and as total fly reduction. The average number of stable flies on the untreated checks generally ranged from a low of 3.9 to a high of 10.4, but in a few instances these limits were exceeded. The horn flies generally varied from a low of 133.5 to a high of 222.9 with a few exceptions. The fly population was affected by the weather, the time of day, the season, the location in the pasture, tall weeds, ponds, etc. In all the tests reported, the population was high enough to give significant results.

In these tests, very high repellency was not desired as much as a good comparison. Spraying the cows in the morning gave better fly control as shown in Test 2, but evening application was considered to be a more severe test on residual repellency. Evening applications were made to compare the formulations given above, containing R-1207 with synergized pyrethrum and two other repellents, R-326 and R-1357. The greatest increase in total fly reduction was over pyrethrum, 54 per cent, and the least with R-1357, only 6 per cent, in total repellency.

Another test was made to determine the minimum amount of pyrethrum needed to obtain a good spray when only 0.5 per cent R-1207 was used. The use of 0.01 per cent pyrethrins increased the stable fly control by 21 per cent and the horn fly control by 15 per cent. Four times as much pyrethrum gave a further increase of 16 per cent and 6 per cent, respectively. Formulation E is an effective, practical spray.

One commercial formulation H now being used in New York and Pennsylvania was included in Test 5. The performance was exceptionally good against horn flies, which from previous experience is to be expected from formulations containing R-326.

Discussion

SCREENING tests for possible fly repellent chemicals have been in progress at this laboratory for the past 10 years. During that time we have come to appreciate many things regarding the concept of fly repellent chemicals. Dethier, et. al. (1960) point out only the terms "repellent" and attractant are commonly used to describe chemicals, despite the diverse behavior patterns elicited by insects. Fly repellents fall in this category. We have yet to test the "Universal Insect Repellent." Some chemicals are intense repellents for a short period of time while others are not quite as intense in the initial repellency, but will persist for several days. Chemicals which are not outstanding repellents when used alone sometimes give outstanding results when formulated with other repellents. Any fly repellent for dairy sprays must eventually be field-tested to determine how it will

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react under field conditions. By the time a repellent is ready for field testing, many laboratory tests have been made and considerable knowledge has been compiled on the chemical, physical, and biological nature of the chemical.

Results of field tests may be reported in as many ways as there are methods of testing. There are so many reactions of flies to repellents that only the person making the fly counts can comprehend the full significance of the test.

When pyrethrum or some other short duration repellent was applied, the normal weathering of the spray soon produced thin spots on which the biting flies land and feed. Because of the short duration of the protection, the same thing happens day after day. When a more residual repellent was added to the same formulation, these spots failed to appear after the second application. The addition of a small amount of a good repellent to the normal pyrethrum spray results in improved protection. The result is pleasing to the farmer because he sees fewer flies on his cows.

A fly control program that includes sanitation and the use of repellent-type sprays on the dairy animals plus the provision of toxic surfaces to which the flies can be driven will result in good control of flies throughout the entire season.

Summary

A METHOD of testing the outstanding repellent, 3-chloropropyl *n*-octyl sulfoxide (1207), for house flies, horn flies, and stable flies and of reporting the results of the tests in comparison to other repellent formulations is given. In these tests, a mixture of 1207 and MGK-264 gave better protection from stable flies and horn flies than did a standard synergized pyrethrum spray. Better results were given when the cows were sprayed in the morning rather than in the evening. No significant difference was found between 1207, 3-chloropropyl *n*-octyl sulfoxide, and 1357, allyl *n*-octyl sulfoxide. Inclusion of a repellent such as 1207 or R-326, di-*n*-propyl isocinchomeronate, in a synergized pyrethrum spray formulation improves repellency and protection.★★

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W. L. Yearsley has been placed in charge of the Denver (Colo.) sales office of the Chase Bag Co., New York. He has been with the firm since 1937.

INTERNATIONAL MARKET ROUNDUP

INTERNATIONAL trading in fertilizers continues with considerable quantities of materials moving. Supplies of materials are keeping pace with demand and the very large surpluses which have been the case in the past, seem to be less pronounced. Availability of such materials as potash and triple superphosphate is even severely limited at times, due to increased consumption of these items. As a result, the price level in various countries has even increased, noticeably in Korea and India, which are large buyers of Nitrogen.

The commercial fertilizer market in Korea has, for the first time, taken a bad turn. This was due to the fact that under the 'Caretaker Government' export dollars were permitted for the first time to be used for the importation of Japanese ammonium sulphate. This resulted in very heavy shipments from Japan to Korea, probably in excess of what local consumers could absorb. Also, the period since the departure of the Rhee Government has seen a general slowdown in business activity, with the result that sales of all commodities have decreased considerably. At the present time, Korean importers are suffering losses on their imports of ammonium sulfate, the first time that this has ever happened and probably the situation will not improve until the start of the next fertilizer season.

The "Freedom from Hunger" Campaign of the Food & Agriculture Organization of the United Nations has now gotten underway with the principal subscribers being the European nitrogen producers, as well as the International Superphosphate Manufacturers Association. Contributions also are expected to come from the Potash Institute and the Sulphur Institute as well as possibly from the Japanese nitrogen industry. There is some possibility of contributions being made by certain individual companies as well.

Expenditures in the first year will be $350,000, and $450,000 in the second year. The entire program is expected to take five years.

Along these lines, other programs are presently underway for the promotion of the use of fertilizer, particularly in India, where programs are currently being carried out by producers and other interested parties who are cooperating with the Indian Government in the use and consumption of such items as calcium ammonium nitrate, ammonium sulphate nitrate, urea, potash, and triple superphosphate. It is expected that these various programs will result in larger consumption abroad of fertilizers and fertilizer materials, especially in the so-called under-developed countries.

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TALE ENDS

A rather warm California welcome to the N.A.C.A. was contained in an article by three California doctors, connected with the California Department of Health, which appeared in the August issue of *Archives of Environmental Health*, an A.M.A. publication. Drs. Irma West, Goldy Kleinman and Marguerite Augustine warned that agricultural chemicals are creating "an increasingly important public health problem" in California. They report 1,093 cases of poisoning or skin damage resulting from workers handling such products, this total having increased significantly over figures for previous years (910 cases in '58, and 749 in '57). As an answer to the problem, the lady doctors observe that farmers are tending to rely more and more on trained custom applicators to apply pesticides. They also recommend, and few will disagree with this conclusion at least, that "there must be widespread education in the proper use of these chemicals" if health and life are to be safeguarded.

AC

Trouble and more trouble is the story on the ill-starred fertilizer plant constructed in Korea under the aegis of the International Cooperation Administration by the F. H. McGraw Co. of New York, and paid for by "you know who." Even after expenditure of almost forty million dollars of U. S. aid funds and over five years since construction was started, the plant, designed to produce 85,000 tons of urea annually, shows no signs of being able to approach the projected rate. It was recently shut down altogether to permit repair of defective parts. A test run was scheduled for mid-September to check on ability to meet rated capacity. Some observers have charged that unless "excessive capital costs" are written off, it may never be possible to operate the plant on a commercial basis.

AC

A snake repellent and reptilicide is shortly to be marketed by a new concern in Griffin, Georgia, doing business as Animal Repellents, Inc. The patented chemical formula is said to contain eight active ingredients. It is a granular product which will be called "Snake-Stop." Recommended rate of use is one pound per 420 square feet of treated area. Dr. James H. Jenkins, assoc. prof. of wildlife, Univ. of Georgia, developed the formula. "Snake-Stop" will be marketed through the usual garden supply outlets.

AC

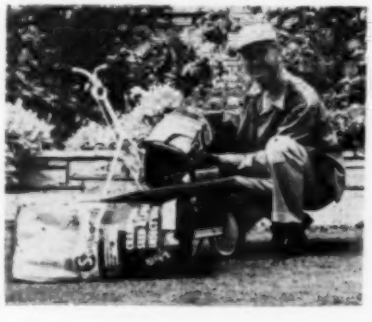
A concern in West Germany has recently brought out manure fertilizer sticks for feeding house plants under the name "Vitaflor." The sticks are simply pressed into the soil near the rim of the flower pot, and reportedly last for several weeks.

AC

A long term (80 year) experiment to check on the life span of weed seeds was terminated a few weeks ago at Michigan State University. Dr. G. P. Steinbauer and Dr. H. T. Darlington of the university's department of botany and plant pathology, dug up what remained of twenty species of weed seeds buried eighty years ago. Only three still produced seedlings, and of the three the first two germinated in just a few cases. The third weed, however, still showed over 70% viability, thereby making it (moth mullein) the acknowledged champ in the life expectancy marathon.

AC

Film actor Robert Young models a special premium-offer gardener's hat offered by Seaboard Seed Co. to users of its grass seed and other lawn products. The straw lid comes for a quarter and the usual box top. Seaboard products are advertised on the Robert Young TV show "Father Knows Best."



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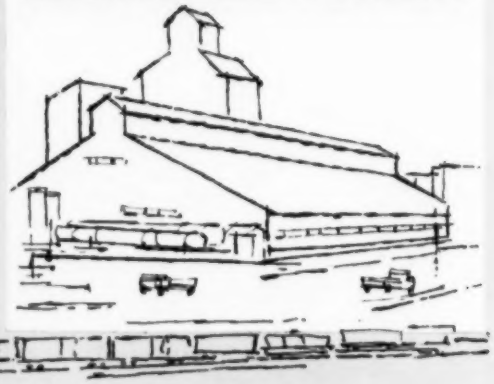

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